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Displaced Volume and Power in Rolling Mills

Identity of Results Obtained from Two Commonly Used Equations — Formula for Calculating Net Rolling Work—Existing Formulas for Spreading Incomplete

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The calculation of the displaced volume cannot be carried out in a theoretically correct way, because it is not possible to determine exactly the direction of flow of the steel particles when an ingot is moving between two rolls, which are pressing on its surface. Several forces, acting on the ingot, have to be considered, such as shearing forces (viscosity), tensile pull, surface forces (pressure and friction). Besides, these forces all act in different directions and it is mainly for this reason that it has not been possible up to the present time to combine all these items in one simple equation.

As early as 1870 Prof. de St. Venant in Paris tried his skill in solving the problem. He obtained different equations of a higher order and degree, which, however, could not be solved. Later on, careful investigations on the matter have been made in Germany by Kick, Blass, Hollenberg and others. Hollenberg tried to derive a formula which would give him some relation among the different items in question, but he came to the same result as Prof. de St. Venant; his equations were too complicated and could not be used for any practical purposes. Further investigations in this direction have been made since the early nineties of the last century up to the present time and for this reason no theoretically correct equations are on hand for the calculation of the displaced volume. We have, therefore, to use those which can be derived by simple mathematical process.

The two equations in general use are

$$V_d = (A - a)\, L \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

$$V_d = AL \text{ hyp. log. } \frac{A}{a} \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Each one of these formulas has its adherents and each party claims that the formula he uses is the only correct one. The author has proved that equation 2 is only a special case of equation 1. One of the main objections against using formula 2 is that it holds good only for an infinite number of passes. There is another objection, that the hyp. log. formula (i.e., equation 2), should not be applied for the calculation of the displaced volume.

If the quotient A/a becomes equal to or greater than 2.718, the hyp. log. A/a will be equal to or become greater than 1. That means, if we roll the ingot in one pass from a certain original area down to another one which is 1/2.718 of the former (36.8 per cent), the displaced volume is equal to or more than the original volume. This, of course, is impossible, because we cannot displace more material at one time than we have on hand.

This condition seems to show that equation 1 deserves preference over equation 2. But does there not exist a condition which shows that equation 1 should be rejected for quite a similar reason? For the determination of this condition we have to keep in mind that equation 1 takes only care of the reduction in area, expressed by $A - a$, but not of the alteration in area; that is, the formula does not consider how the reduction takes place. Fig. 1 may illustrate this.

Let us assume that a billet, 12 in. high, 8 in. wide and 72 in. long is reduced in one pass to a section 8 in. high and 9 in. wide. The draft is, therefore, 4 in. and the displaced volume should be equal to the shaded area, multiplied by the length of the billet before the pass, or

$$V_d = 4 \times 8 \times 72 = 2304 \text{ cu. in.}$$

Equation 1 gives

$$V_d = (12 \times 8 - 8 \times 9) \times 72 = 1728 \text{ cu. in.}$$

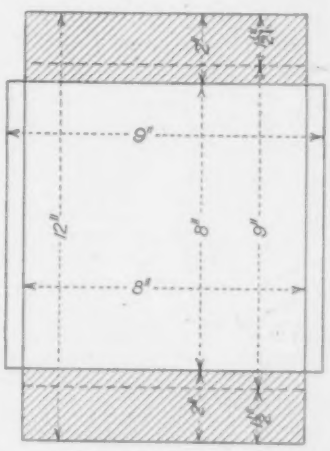

Fig. 1—Sketch Showing Reduction in Area

The same value will be obtained when, for the same area after the pass, no spreading is assumed. The section would then be 9 in. high and 8 in. wide, with a draft of 3 in. We have then

$$3 \times 8 \times 72 = 1728 \text{ cu. in.}$$

But the draft is actually 4 in.; 1 in. is therefore disregarded and this 1 in. corresponds to a displacement of

$$1 \times 8 \times 72 = 576 \text{ cu. in.}$$

which is the difference between 2304 cu. in. and 1728 cu. in. This difference of 576 is found in the spreading alongside the billet, corresponding to its length before the pass, viz.:

$$(9 - 8) \times 8 \times 72 = 576 \text{ cu. in.}$$

This shows that the equation $V_d = (A - a)\, L$ takes care only of the material apparently moved in a longitudinal direction, but not of that material which is used directly for increasing the width of the original billet; or, as was stated before, it takes only care of the actual reduction in area. Now, if we roll an ingot from a section 9 in. high and 8 in. wide down to a section 8 in. high and 9 in. wide, our displacement, as obtained from equation 1 is

$$V_d = (9 \times 8 - 8 \times 9) \times L = 0,$$

yet, nobody would say, that this value represents the volume actually displaced. Here we have an objection against using equation 1 similar to that shown for equation 2.

Here, as well as in the following, the term "volume *actually* displaced" is used only to make a short distinction between the volume obtained from equation 1 and the volume calculated by means of equation 2. Needless to say that, since none of the two equations is theoretically correct, the results obtained by either one of them can only be considered as more or less close approximations.

Somebody, however, might object to the large spreading assumed in the case of equation 1 and might

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say that such a large spreading is impossible. If such an objection would hold good, the example in case of equation 2 does not stand either, because a reduction in area of 63.2 per cent in one pass is also not possible in ordinary rolling practice. This can easily be shown, when we consider that the rolls will not "bite," when the angle of rolling is considerably larger than 30 deg. A reduction in area of 63.2 per cent in practically all cases requires an angle of much more than 30 deg. and for this reason, such a reduction is not possible in ordinary, actual rolling practice. To show this in one example, let us assume that we roll a section 17 in. high, 16 in. wide, in a reversing mill in one pass to a section 6.25 in. high, 16 in. wide, assuming no spreading, or from an area of 272 sq. in. down to an area of 100 sq. in., equal to a reduction in area of 63.2 per cent. The roll radius is, say, 15 in. We then have, if a = angle of rolling

$$\sin a/2 = \frac{1}{2}\sqrt{\frac{H-h}{R}} = \frac{1}{2}\sqrt{\frac{17-6.25}{15}} = 0.42328,$$

or

$$\frac{a}{2} = \text{(about) } 25 \text{ deg.}; \; a = \text{(about) } 50 \text{ deg.}$$

which is too large.

The objection may be raised that, when rolling smaller sections, conditions might be found which would show that a reduction in area of 63.2 per cent is possible. It is true that for smaller sections the angle of rolling will be reduced, but under ordinary rolling conditions and using data from actual good rolling practice the decrease will not come down to required angle of 30 deg.

If we calculate the displaced volume by means of the two formulas, we find, that, when rolling down from a certain original section and length, the displaced volume, as calculated by means of equation 2 will always be constant, no matter in how many passes the ingot is broken down. On the other hand, when applying equation 1, the displaced volume increases with an increasing number of passes. Table 1 shows this condition. We see that, when rolling from a section of, say, 10 x 4 in., 60 in. long, down to a section of 5 x 5 in., the sum of the displacements as calculated by equation $V_d = AL$ hyp. log. A/a is always constant and equal to 1128 cu. in., while the sum of the displacements obtained from $V_d = (A-a)\,L$ increases with the number of passes. We see at the same time that the ratio

$$\frac{AL \text{ hyp. log. } A/a}{\Sigma\,(A-a)\,L}$$

must decrease and must approach unity, the larger the number of passes. In our case, for eight passes we have $1128 \div 1092 = 1.033$, or a difference of 3.3 per cent; for thirteen passes this difference would be equal to $1128.0 \div 1106.5 = 1.01$ or 1 per cent. This shows that for rolling a certain final section from a certain original section and length, it does not make any difference at all, which one of the two equations for the total V_d is used, if only the number of passes is large enough. In the case shown on Table 1, thirteen passes would be sufficient to make the difference negligible for all practical purposes.

Table 1—Comparison of Displacements, Calculated by Expressions Given in Column 6 and Column 9

Pass. No.	Section	Area	$A-a$	L	$(A-a)\,L$	$\frac{A}{a}$	Hyp. Log. $\frac{A}{a}$	$AL \times$ Hyp. Log. $\frac{A}{a}$
1	2	3	4	5	6	7	8	9
				One Pass				
1	5 x5	25	15	60	900	1.60	.4700	1128.00
				Two Passes				
1	7½x4½	33.75	6.25	60.0	375.0	1.186	.1699	407.8
2	5 x5	25.0	8.75	71.11	622.22	1.350	.3001	720.2
Total..			15.00		997.22		.4700	1128.0
				Four Passes				
1	8½x4½	37.19	2.81	60.0	168.60	1.0756	.0728	174.72
2	7½x4½	33.75	3.44	64.53	221.98	1.1019	.0970	232.80
3	6½x4½	29.69	4.06	71.11	288.71	1.1367	.1282	307.68
4	5 x5	25.00	4.69	80.83	379.09	1.1876	.1720	412.80
Total..			15.00		1058.38		.4700	1128.00
				Eight Passes				
1	9½x4½	38.67	1.33	60.00	79.80	1.0344	.0338	81.12
2	8½x4½	37.19	1.48	62.06	91.85	1.0398	.0390	93.60
3	8½x4½	35.55	1.64	64.53	105.83	1.0461	.0451	108.24
4	7½x4½	33.75	1.80	67.51	121.52	1.0533	.0520	124.80
5	6½x4½	31.80	1.95	71.11	138.66	1.0613	.0595	142.80
6	6½x4½	29.69	2.11	75.47	159.24	1.0711	.0687	164.88
7	5½x4½	27.42	2.27	80.83	183.48	1.0828	.0796	191.04
8	5 x5	25.00	2.42	87.53	211.82	1.0968	.0923	221.52
Total..			15.00		1092.20		.4700	1128.00

Original section, 4x10 in.; original area, 40 sq. in.; length, 96 in.; volume, 2400 cu. in.

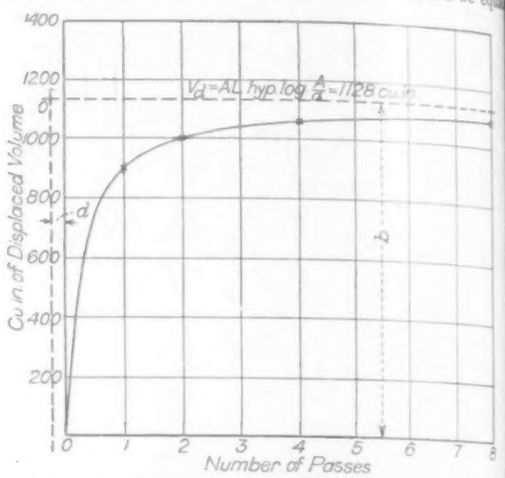


Fig. 2—Curve Showing Relation between Displaced Volume and Number of Passes

Investigating farther into the subject, we find the following condition. If we plot the different ΣV_d, as obtained from equation 1 and as shown in Table 1, in a coordinate system with the x-axis representing the number of passes and the y-axis representing the displaced volume, we can connect the points thus obtained by a smooth curve, as shown in Fig. 2. The curve starts at 0, rises quickly to a certain value of V_d, then turns sharply to the right and approaches the horizontal line, representing the total displacement, as obtained by the hyp. log. formula. This line forms an asymptote to the curve, which latter is an equilateral hyperbola. Now, since the plotting of the points gives us a curve of a definite character, it must be possible to derive an equation for this curve, which, then, would allow us to calculate the total displacement or

$$V_d = \Sigma\,(A-a)\,L$$

directly, instead of having to calculate V_d pass for pass and then adding up the values thus obtained. This short-cut, of course, is only applicable for calculations of a general character; for the exact determination of the size of a mill-engine or a mill-motor the calculation should be carried through pass for pass, in order to determine the most unfavorable conditions.

The equation of an equilateral hyperbola, referred to right-angled asymptotes is $xy = \text{constant}$; that means, the product of the coordinates for any point of the curve is a constant. This equation refers to a coordinate system as shown by dotted lines in Fig. 2, the 0-point being in the left upper corner and the x- and y-axis in the position as indicated. For our purpose, i.e., for the coordinate system shown in full lines in Fig. 2, with the 0-point in the left corner, the equation has to be transformed. After this transformation it will read

$$(x+d)\;(b-y) = c$$

where

x represents the number of passes,

y represents the total displacement from $(A-a)\,L$, corresponding to the number of passes x,

b represents the displacement obtained from $V_d = AL$ hyp. log. A/a.

For the determination of c and d two equations are

at our disposal. The first one arises from the condition that y must be 0 when x will be 0; therefore

$$db = c$$

The second equation may be obtained by assuming that the ingot is rolled from the given original section to the given final section in *one* pass and then calculating the displaced volume for this condition by means of the formula $V_d = (A - a)\ L = y_a$.

This gives

$$(1 + d)\ (b - y_a) = c.$$

Combining both equations we obtain

$$db = (1 + d)\ (b - y_a),$$

whence

$$d = \frac{b - y_a}{y_a} = \frac{b}{y_a} - 1.$$

From this we have

$$c = db = \left[\frac{b}{y_a} - 1\right] b.$$

Substituting these values for c and d in the original equation gives

$$\left[x + \frac{b}{y_a} - 1\right](b - y) = \left[\frac{b}{y_a} - 1\right] b,$$

or, dissolving for y

$$y = \frac{xb}{x + \frac{b}{y_a} - 1}.$$

Substituting, finally, the actual terms, we obtain

$$y = \Sigma\ (A - a)\ L = \frac{\text{No. of passes times } AL \text{ hyp. log. } A/a_n}{\text{No. of passes} + \dfrac{AL \text{ hyp. log. } A/a_n}{(A - a_n)\ L} - 1} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

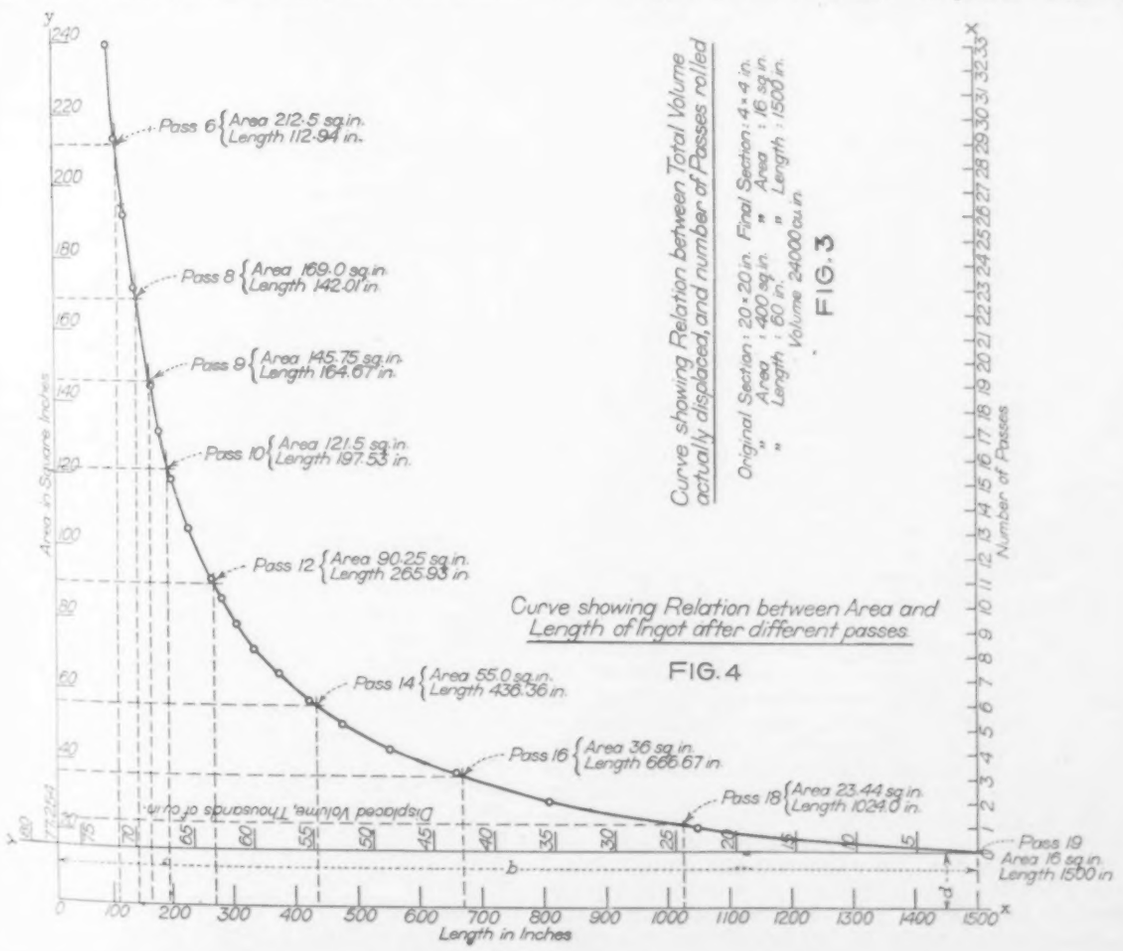
This formula shows again, that there exists a relation between equations 1 and 2. It also gives the mathematical proof for the deduction made from Table 1, that for a certain original area and length and for a certain final area the displaced volume as obtained from the summation of the values calculated with $V_d = (A - a)\ L$ will come the closer to the value for V_d, obtained from the hyp. log. formula, the more the number of passes used in rolling. It shows, furthermore, that it takes the more passes to bring forth the coincidence between the two values, the larger the difference between the original and the final section of the ingot.

The formula has been tried out and found to check closely with displacements obtained step by step and then added up; it may, therefore, be used as a check for the sum of the displaced volumes. The difference between the two values should not be more than about 0.75 per cent. In case a larger discrepancy is found this is mostly due to an error in the calculation of the displaced volume for one or, may be, more passes. A large discrepancy may also be due to calculating V_d for the first pass or for the first few passes, not by means of equation 1, but separately, considering the ingot to be a frustum of a pyramid.

It was stated above that the equation for an equilateral hyperbola is $xy = c$. This is the equation which gives the relation of the area and the length of an ingot in regard to its volume:

$$AL = V = c.$$

Since we started the derivation of the equation for $\Sigma\ V_d$ from the equation $xy = c$, we must be able to obtain a relation between the two formulas, i.e., between $AL = V = c$ and $y = \Sigma\ (A - a)\ L$ (see equation 3). In order to determine this relation, let us assume that we roll an ingot from an original section of 20 x 20 in., 60 in. long down to a final section of 4 x 4 in. The total displacement $[= \Sigma\ (A - a)\ L]$ for a varying number of passes is shown in Table 2. The total displacement, calculated by means of the hyp. log. formula, amounts to 77,254 cu. in., the volume of the ingot being $20 \times 20 \times 60 = 24{,}000$ cu. in. If we plot the values from Table 2 as ordinates against the number of passes as abscissæ, we obtain the curve shown in Fig. 3. For proving the identity of this hyperbola with the other one following the equation $AL = V = c$, it is only necessary to show the coincidence in a few points. Assuming the work is done in nineteen passes, we may work out a rolling schedule, from which the areas and lengths in Table 3 are calculated. Now, we must remember that the zero-point for the curve $xy = c$ (or $AL = V$) is in the upper left hand corner of the figure (see Fig. 2). We must remember, furthermore, that we are dealing with different units: in the one case we have "number of passes" and "vol-



Curve showing Relation between Area and Length of Ingot after different passes.

FIG. 4

Table 2—Relation Between Number of Passes Rolled and the Total Volume Displaced

Pass	$\Sigma(A-a)L$	Pass	$\Sigma(A-a)L$
1	23,040	11	63,640
2	35,495	13	65,414
3	43,296	15	66,779
4	48,641	17	67,861
5	52,532	19	68,741
6	55,492	23	70,084
7	57,818	26	70,843
8	59,696	29	71,456
9	61,242	33	72,112

umes," in the other case "areas" and "lengths."

The term b in the old system represents the total displacement obtained from $V_d = AL$ hyp. log. A/a. In the new system it represents the final length of the ingot "l_n," or, in our case, 1500 in. The value of d in the old system is equal to

$$d = \frac{AL \text{ hyp. log. } A/a}{(A - a_n)\,L} - 1 = \frac{24{,}000 \times 3.2189}{(400 - 16)\,60} - 1 = 2.353;$$

in the new system it is equal to the final area $= a_n = 16$ sq. in.

With these data the new divisions of the coordinate

Table 3—Areas and Lengths for Different Passes

Pass	Area	Length	Pass	Area	Length	Pass	Area	Length
6	212.5	112.94	10	121.5	197.53	16	36.0	666.67
8	169.0	142.01	12	90.25	265.93	18	23.44	1024.0
9	145.75	164.67	14	55.0	436.36	19	16.0	1500.0

axes have to be made. We have $d = 2.353$ units on the (old) x-axis. These 2.353 units correspond, therefore, to 16 sq. in., or 10 sq. in. correspond to $\frac{2.353 \times 10}{16} = 1.50$ (exactly 1.47) units. This will be the division on our new y-axis, which runs parallel to the old x-axis at a distance of $b = 1500$ in. On the new x-axis which is parallel to the old y-axis at a distance of $d = 2.353$ units $= 16$ sq. in., the distance between the old x-axis and the new zero-point is to be equally divided; in our case we may make a new division corresponding to, say, 100 in., which gives fifteen divisions.

If we now plot on the new coordinate system, pass for pass, our points corresponding to equation $AL =$ const. $=$ vol., as given in Table 3, we obtain a curve which is identically the same as the one which we had obtained by plotting the sum of the displaced volumes for a varying number of passes (see Fig. 4).

This shows that we have another means to check the sum of our displacements. The areas and lengths of the ingot after the different passes must be calculated anyhow. We obtain curve $AL = V$ in the ordinary way, then turn the curve around 90 deg. and change the zero point from its old place to the new one, located at the intersection of the lines representing L_n and a_n. The vertical distance between the original y-axis and the new zero-point is equal to, in our case, 77,254 cu. in. and may be divided up accordingly (see Fig. 3). The distance d, representing the final area, must for the new system be calculated as shown above and is then expressed in units of the new x-axis. In our case $d = 2.353$; that is, d represents 2.353 units of the new x-axis. From this condition we obtain the length of the divisions on this axis, plotting them from the new zero-point to the right. They represent the number of passes. We now can use the curve for checking the total displacement as obtained by calculating the displaced volume for each pass and adding up the values thus obtained. For instance, what will be the volume actually displaced, if we roll the ingot down in nineteen passes? Fig. 3 gives the answer. Going up vertically from point 19 on the x-axis until we intersect the curve, then from the intersection horizontally over to the corresponding y-axis (the x- and y-axis belonging to Fig. 3 are shown in full lines), we find 68,700 cu. in.; similarly, for 23 or 29 passes we have 70,000 cu. in. and 71,500 cu. in. respectively. The corresponding values calculated are 68,741, 70,084, and 71,456 cu. in., respectively, i.e., differences which are so small, that they can easily be neglected.

This shows that we might use the curve, plotted from $AL = V$ for the calculation of the volume actually displaced in a certain number of passes, after having changed the coordinate system to suit the new conditions. It shows also another relation between equation 1 and equation 2, when we consider the fact that the equation $AL = V$ forms the base for calculating the displaced volume by means of the hyp. log. formula (equation 2). The derivation is, in short, as follows:

If we assume an infinite number of passes, the reduction in area will become infinitesimally small $= dA$. Then

$$dV = dA \times L. \quad \text{Now } L = al/A.$$

This inserted into the equation for dV gives

$$dV = \frac{dA}{A}\,al,$$

or, since $al = AL$,

$$dV = \frac{dA}{a}\,AL.$$

Integrating between the limits A and a gives, finally

$$V_d = AL \text{ hyp. log. } A/a.$$

Using the displaced volume, as obtained from equation 1, for the calculation of the unit power requirements, in our case hp.-sec./cu. in. (see Table 4, column 6), and plotting the values obtained as ordinates against the corresponding drafts as abscissæ, we find that we can combine the different points into two or more curves which are distinctly separated from each other. In Fig. 5 curves A and B represent two such curves. Investigating the matter by the aid of Table 4, we will see that the points of curve A (marked by x) correspond to the passes rolled in one groove and that the points of curve B (marked by 0) correspond to the passes rolled in another groove. The mean radii of

Table 4—Power Requirements for One Ingot

Pass	Draft	Hp.-sec.	$V_d = (A-a)\,L$	Hp.-sec. Cu. in.	Hp.-sec. Cu. in. $R=1$ ft.	$V_d = AL$ Hyp. Log. $\frac{A}{a}$	Hp.-sec. Cu. in.	Hp.-sec. Cu. in. $R=1$ ft.
1	3	4	5	6	7	8	9	10
1	1¼	4,274	2,087	2.05	2.01	1,084	3.94	3.81
2	1½	4,192	1,861	2.25	2.21	1,933	2.17	2.13
3	1½	4,500	2,009	2.24	2.20	2,095	2.15	2.11
4	1⅝	4,042	1,880	2.15	2.11	1,956	2.06	2.02
5	1½	5,126	2,268	2.26	2.22	2,376	2.16	2.12
6	1¾	8,022	3,178	2.52	2.48	3,397	2.33	2.29
7	2¼	7,482	2,428	3.08	2.99	2,552	2.93	2.84
8	2¼	6,789	2,433	2.79	2.71	2,560	2.65	2.57
9	1¾	6,362	2,623	2.43	2.36	2,770	2.30	2.23
10	2	9,474	3,597	2.63	2.55	3,879	2.44	2.37
11	3	14,902	4,629	3.22	3.13	5,113	2.91	2.82
12	2¼	14,738	5,445	2.77	2.63	6,133	2.40	2.28
13	3¼	20,148	6,261	3.22	3.25	7,195	2.80	2.83
Total..			40,719			43,043		

Original area, 368.5 sq. in.; original length, 68.58 in.; final area, 67.1 sq. in.; volume, 25,272 cu. in.; roll radius for passes 1 to 6 inclusive, 12.5 in.; for passes 7 to 12 inclusive, 12.75 in., and for pass 13, 11.75 in.

these two grooves are (approximately) 12¾ in. and 12½ in. That we are dealing with curves and not with straight lines, as might be suggested by the location of the points in regard to each other, is proved by the fact that for a draft $d = 0$ we must have hp.-sec./cu. in. $= 0$. The connection from the points in curves A and B to 0 can only be made by means of a curve.

We now have a relation between the draft and the hp.-sec./cu. in. within certain limits, but none which holds good for the whole ingot. The effort was therefore made to obtain such a relation by reducing the different values to a common base, in this case to a radius of 1 ft., by simply dividing the different values by the square root of the corresponding roll-radius, expressed in feet. The reason that the division was made by the square root of the radius and not by the radius proper lies in the fact that the power required to roll steel is proportional directly—not to the radius—but to the square root of the radius. This is stated by all authorities on rolling-mill power, as far as they have investigated the items which influence the power requirements (see, for instance, Blass in *Stahl und Eisen*, 1883, and Edwards in the Proceedings of the Engineers' Society of Western Pennsylvania, Nov., 1913).

After dividing by $\sqrt{R}$, we obtain the values given in column 7, Table 4, which, then, are represented by

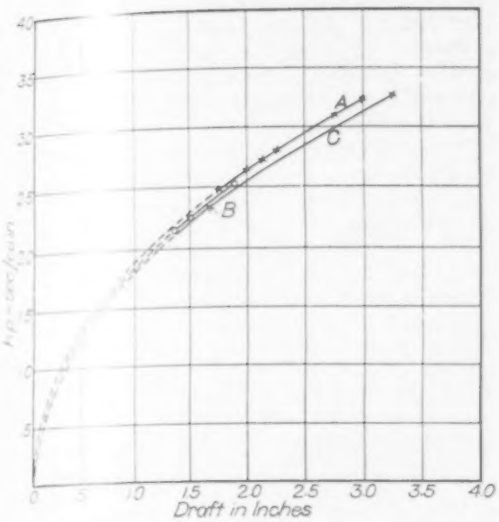


Fig. 5—Curves Showing Relation between hp.-sec./cu. in., Draft and Roll Radius—V_d calculated from $(A-a)L$

curve C, Fig. 5. This shows that all the values can be connected by one smooth curve after reducing them to a radius of 1 ft.

In Fig. 5 as well as in all those following, showing the relation between different items—roll-radius, temperature of ingot, etc., and others on the one side and the power required on the other side—the first pass is omitted. This is done, because the ingot when entering the rolls for the first pass has the shape of a frustum of a pyramid. It is for this reason difficult to determine the exact amount of the volume displaced. This volume can, it is true, be determined with some degree of accuracy, when the ingot is caught by the rolls as soon as it enters them, but it cannot be determined, should the ingot be within the rolls for a certain length, before the rolls "bite." This condition is illustrated in Fig. 6, somewhat exaggerated. Besides, the ingot may not be solid all the way through, containing some piping, which also makes the calculation of V_d for the first pass unreliable. The influence of this omission on the total power required (total hp.-sec.) is only small and can be covered by the additions to be made for other items which are indeterminable and which will be enumerated later on.

The manner applied to reducing the values in column 6 to those in column 7, Table 4, gives a means to determine the character of the curves shown in Fig. 5. We obtained the final hp.-sec./cu. in. by dividing the original hp.-sec./cu. in. by the square root of the roll-

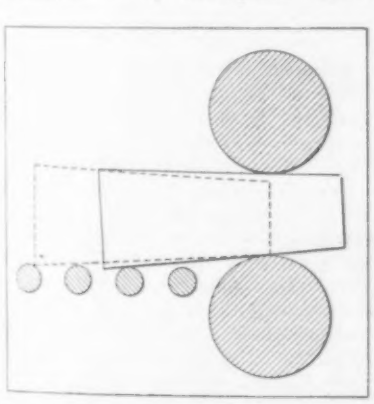


Fig. 6—Relation between Conicity of Ingot and Position of Ingot When Rolls Bite

radius, or, expressing this by an equation, we have

final hp.-sec./cu. in. = original hp.-sec./cu. in. $\div \sqrt{R}$

or

original hp.-sec./cu. in. = final hp.-sec./cu. in. $\sqrt{R}$.

This is the equation of an ordinary parabola of the form $y^2 = 2px$, where y is represented by the term "original hp.-sec./cu. in."; $2p$ by the "(final hp.-sec./cu. in.)" and x by R.

Since we are dealing with a parabola, we must be able to determine the hp.-sec./cu. in. corresponding to different drafts from a certain base. Taking $d = 1$ in. as this base, our equation alters into

$$\left(\frac{\text{hp.-sec.}}{\text{cu. in.}}\right)_{\substack{d=x\\R=x}} = \left(\frac{\text{hp.-sec.}}{\text{cu. in.}}\right)_{\substack{d=1\\R=1}} \sqrt{d_x R_x} \quad . . (4)$$

that means:

The unit power (hp.-sec./cu. in.) for any draft $d = x$ in. and any roll-radius $R = x$ ft. is equal to the unit power for $d = 1$ in. and $R = 1$ ft., multiplied by the square root of the product: Draft times roll-radius. Later on we will see to what extent this equation can be used for the calculation of the net rolling power.

Can we derive the same or at least a similar relation, when applying equation 2 ($V_d = AL$ hyp. log. A/a) for the calculation of the unit power? Proceeding as before we obtain the values shown in columns 8, 9 and 10, Table 4. The data from columns 9 and 10 are plotted in Fig. 7 in the same manner as the values of columns 6 and 7 are plotted in Fig. 5. The points marked 0 in Fig. 7 correspond to those having the same marks in Fig. 5, and the same holds good for the points marked x. After reducing to a radius of 1 ft., the reduced values are connected by a broken line. We

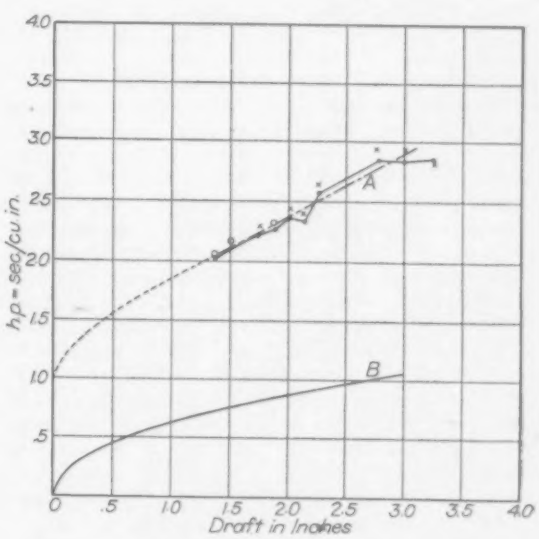


Fig. 7—Relation between hp.-sec./cu. in., Draft and Roll Radius—V_d calculated from AL hyp. log. A/a

see that there is some irregularity, or, at least not the same regularity, between these points, as there was in Fig. 5; yet, this irregularity is not of such an extent as to prevent us from tracing an average line through the points plotted. This average line is represented by curve A, which follows the equation

$$\text{Num}\left[\text{hyp. log.}\left(\frac{\text{hp.-sec.}}{\text{cu. in.}}\right)_{\substack{d=x\\R=x}}\right] = \text{Num}\left[\text{hyp. log.}\left(\frac{\text{hp.-sec.}}{\text{cu. in.}}\right)_{\substack{d=1\\R=1}} \sqrt{d_x R_x}\right] . . (5)$$

Since we deal here with antilogarithms, and, since the antilogarithm of 0 is, in any logarithmic system, equal to 1, we have the condition that, for $d = 0$, our unit power becomes 1. This apparent impossibility, however, will disappear, when we plot the logarithms proper, instead of the antilogarithms, as shown in curve B, Fig. 7. The logarithms and antilogarithms from $d = 1$ upward are given in Table 5.

Table 4 furnishes a means to check equation 3. In column 5 we have the total displaced volume from $V_d = (A - a)\,L$ amounting to 40,719 cu. in. The total displaced volume from $V_d = AL$ hyp. log. A/a is given in column 8 as 43,043 cu. in. The volume of the ingot is 25,272 cu. in. For equation 3 we need the total displacement from equation $V_d = (A - a_n)\,L$, which, in our case, is $(368.5 - 67.1) \times 68.58 = 20,670$ cu. in. Now we have

$$y = V_d = \frac{13 \times 43{,}043}{13 + \frac{43{,}043}{20{,}670} - 1} = \frac{559{,}559}{14.082} = 39{,}735 \text{ cu. in.}$$

Against our displacement of 40,719 cu. in. this

Table 5—Hyperbolic Logarithms and Antilogs (Curves A and B, Fig. 7)

Draft, in.	0.25	0.50	0.75	1.0	1.5	2.0	2.5	3.0
Hyp. log. $\left(\frac{\text{Hp.-sec.}}{\text{Cu. in.}}\right)$	0.310	0.436	0.534	0.620	0.751	0.871	0.973	1.067
Antilog	1.36	1.54	1.71	1.86	2.12	2.39	2.65	2.91

means a difference of 984 cu. in. or about 2.4 per cent. This difference is, as was stated before, too large to be passed by as due to inaccuracies in the calculation; it can, however, be traced back to its origin. The displacement of the first pass, viz., 2087 cu. in., was computed directly from the dimensions of the ingot and the height of the pass, i.e., considering the ingot as being a frustum of a pyramid. If we use equation 1 for the calculation of the displaced volume in question, we obtain 1063 cu. in. This value, therefore, should be considered as the displacement of the first pass, if we want to compare the data. We have then $40{,}719 - 2087 + 1063 = 39{,}695$ cu. in., and this is practically the same figure as the one obtained by the use of equation 3.

In the Proceedings of the Engineers' Society of Western Pennsylvania, July, 1914, page 602, data are given, originating from a test made on the new 44-in. reversing blooming mill of the Youngstown Sheet & Tube Company. From this the "engine coefficient" C is figured to be 13,700. This "engine coefficient" is always given, when the hyp. log. formula (equation 2) is used for the calculation of the displaced volume. What does this "engine coefficient" actually represent? According to the derivation it means "Foot-pounds of net work per unit volume of displacement." This unit volume of displacement is expressed by a volume 1 sq. in. in area by 1 ft. long, i.e., in other words, by 12 cu. in. To make the figure comparable with the one obtained by using the equation $V_d = (A - a)\,L$, we have to divide the engine coefficient by $550 \times 12 = 6600$. This gives $13{,}700 \div 6600 = 2.075$ hp.-sec. per cu. in. What will be the corresponding value, when we use equation 1? Since no data of the areas and lengths of the different passes are given, we have to use equation 3 for the calculation of the actually displaced volume. We have

$$\Sigma\,(A - a)\,L = \frac{\text{No. of passes times } AL \text{ hyp. log. } A/a_n}{\text{No. of passes} + \dfrac{AL \text{ hyp. log. } A/a_n}{(A - a_n)\,L} - 1}$$

where

No. of passes $= 15$.
volume $= AL = 380 \times 4.75 \times 12 = 21{,}660$ cu. in.
AL hyp. log. $A/a_n = 380 \times 4.75 \times 12 \times 2.375 = 51{,}442.5$ cu. in.
$(A/a_n)L = (380 - 35.4) \times 4.75 \times 12 = 19{,}642.2$ cu. in.

$$\frac{AL \text{ hyp. log. } A/a_n}{(A - a_n)\,L} = \frac{51{,}442.5}{19{,}642.2} = 2.619.$$

These values inserted into the equation give

$$\Sigma\,(A - a)\,L = \frac{15 \times 51{,}442.5}{15 + 2.619 - 1} = \frac{771{,}637.5}{16.619} = 46{,}431 \text{ cu. in.}$$

Our hp.-sec./cu. in. will then be

$$\frac{58{,}615{,}000^*}{46{,}431 \times 550} = \frac{58{,}615{,}000}{25{,}537{,}050} = 2.295 \text{ hp.-sec./cu. in.}$$

This figure is and must be larger than the one obtained directly from the engine coefficient, because the total displacement from equation 2 is larger than that from equation 1. Now, the ratio of the volumes must necessarily be inversely the same as the ratio of the corresponding hp.-sec./cu. in., or

$$\frac{51{,}442.5}{46{,}431} = 1.107, \text{ and } \frac{2.295}{2.075} = 1.106.$$

Therefore, if we multiply 2.075 hp.-sec./cu. in. by the ratio of the volumes, i.e., by 1.107, we must obtain practically the same unit power as we had calculated by means of the total volume actually displaced; we get $2.075 \times 1.107 = 2.297$ hp.-sec./cu. in., against 2.295 hp.-sec./cu. in. This proves, that the values are directly comparable, when they are reduced to the same base, which can easily be done, as is shown by the above calculation.

So far it has been proved that calculations of mill tests, based on either one of the equations for the displaced volume, give identical results. It is, therefore, not right to reject the one or the other one of the two equations as being not theoretically correct, the more so, as either one of the two formulas has its defects, as was shown previously.

Further investigation into those items which influence the amount of power required can now be confined to one of the two equations and we choose for this investigation that formula which is based on equation $V_d = (A - a)\,L$. This is done for the only reason that its application is a little more simple than the application of the formula based on $V_d = AL$ hyp. log. A/a. This can be seen from comparing equations 4 and 5. The one deals with square roots only (equation 4), while the other one deals with square roots, hyperbolic logarithms and antilogs (equation 5).

We have, so far, established a relation between the unit power requirements on the one side and the draft and roll-radius on the other side. We also have taken care of the temperature of the ingot, since it influences the value of the term "hp.-sec./cu. in. for $d = 1$ in. and $R = 1$ ft." This term varies inversely with the rolling temperature, as will be shown later. There will be found, however, when working out mill tests, that under certain conditions the values for unit power requirements and the curves for different ingots, obtained from the test data, will show a considerable discrepancy, a discrepancy larger than may be due to errors in observation and calculation. Fig. 8, for example, shows three curves. Curve A represents one ingot; curve B another one. Both curves are reduced to a radius of 1 ft., in the manner shown previously; therefore, since the rolling temperature of both ingots is practically the same, i.e., about 2100 deg. Fahr., the data for the two ingots should be the same. Yet there is a difference in the unit power requirements; this value, for a draft of 1 in. amounts to 1.53 hp.-sec./cu. in. for curve A and to 1.33 hp.-sec./cu. in. for curve B, representing a difference of 15 per cent. This, of course, is too much to be considered as due to errors only.

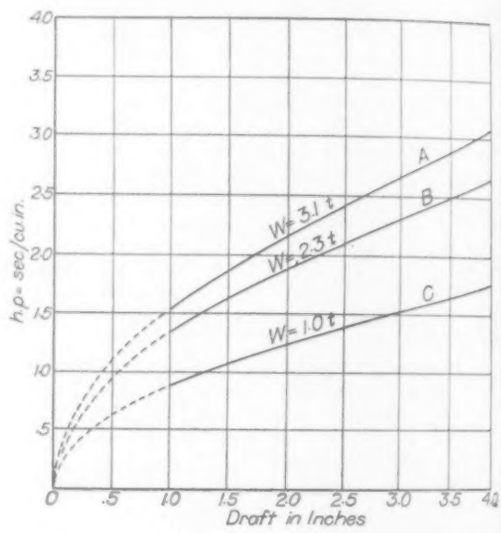


Fig. 8—Influence of Weight of Ingot on the Power Requirements

A more close investigation will show the real cause for the discrepancy. The actual values for the hp.-sec./cu. in., all reduced to a roll-radius of 1 ft., are given in Table 6, columns 2 and 3. The ingot represented by curve A has a weight of 3.1 tons, while the ingot represented by curve B weighed only 2.3 tons. This difference in weight is the cause for the difference in the unit power requirements. If we reduce the figures for curves A and B to a weight of 1 ton, by dividing by the square root of the corresponding weight, we obtain the values shown in columns 4 and 5 of Table 6. They are represented by curve C, Fig. 8.

A comparison of columns 4 and 5 shows that, after the division, the figures are practically the same. Con-

*Net work in foot-pounds to roll ingot.

Table 6—Relation Between Unit-Power Requirements and Weight of Ingot

	Hp.-sec./cu. in. For Actual Weight of Ingot		Hp.-sec./cu. in. For Weight Reduced to 1 Ton	
	Curve A	Curve B	Curve A	Curve B
	2	3	4	5
	1.53	1.33	0.87	0.87
	1.86	1.60	1.06	1.06
	2.15	1.87	1.22	1.23
	2.42	2.10	1.37	1.38
	2.65	2.30	1.51	1.52
	2.89	2.49	1.64	1.65
	3.08	2.66	1.75	1.75

equently, equation 4 must be altered into

$$\left(\frac{\text{hp.-sec.}}{\text{cu. in}}\right)_{\substack{d=x\\R=x\\W=x}} = \left(\frac{\text{hp.-sec.}}{\text{cu. in}}\right)_{\substack{d=1\\R=1\\W=1}} \sqrt{d_x R_x W_x} \quad \ldots\ldots (6)$$

which means, that the power required to roll steel is, for a certain temperature, directly proportional to the square root of the product of draft times roll-radius times weight of the ingot.

In a similar way it can be proved that the rolling speed has a considerable influence on the power required. This power is, however, not directly proportional to the rolling speed, but it is inversely proportional to it; equation 6 alters into

$$\left(\frac{\text{hp.-sec.}}{\text{cu. in}}\right)_{\substack{d=x\\R=x\\W=x\\S=x}} = \left(\frac{\text{hp.-sec.}}{\text{cu. in}}\right)_{\substack{d=1\\R=1\\W=1\\S=1}} \sqrt{\frac{d_x R_x W_x}{S_x}}$$

or

$$A = C\sqrt{\frac{d_x R_x W_x}{S_x}} \quad \ldots\ldots\ldots\ldots (7)$$

where

A = power required to remove 1 cu. in. of material at any draft x, any roll-radius x, any ingot-weight x and any rolling speed x.

C = power required to remove 1 cu. in. of material at a draft $d = 1$ in., a roll-radius $R = 1$ ft., a weight of the ingot of $W = 1$ ton and a rolling speed of $S = 1$ rev. per sec.

Taking into consideration weight and speed, equation 5 will alter into

$$\text{Num. [hyp. log. } A] = \text{Num.}\left[\text{hyp. log. } C\sqrt{\frac{d_x R_x W_x}{S_x}}\right]. \quad \ldots\ldots\ldots\ldots (8)$$

It should not be forgotten that equations 7 and 8 are, in some way, empirical formulas, derived, not by developing some theory on the rolling process or on the flow of steel under certain conditions, but by carefully separating and dissecting data obtained from actual tests made in the United States and abroad on three-high and on reversing rolling mills, steam driven as well as electrically driven. The formulas may, therefore, be easily attacked from a purely theoretical standpoint. It should, however, be kept in mind that, up to the present time, mill-power calculations had to be based on more or less guessing. The equations, derived above, give a distinct and definite relation between draft roll-radius, weight of the ingot, rolling speed, and last, but not least, temperature of the ingot; they eliminate all guesswork with the exception of that which never can nor will be eliminated, that is, the guessing of the amount of work lost in false bites, roll-slips and the like, and, furthermore, the guessing of the amount of losses due to the "personal equation."

The relation between factor C in equations 7 and 8 and the temperature of the ingot is shown in Fig. 9. The curve gives the values for $d = 1$ in.; reduced to unity, that is, to a roll-radius of 1 ft.; a weight of the ingot of 1 ton and a rolling speed of 1 r.p.s. A similar curve may be derived and plotted, showing the hyperbolic logarithms of the unit work for $d = 1$ in., all values being reduced to unity as shown above.

The curves in connection with the corresponding formulas 7 or 8 allow of calculating the total net rolling work, from which, adding a certain percentage for friction and acceleration losses, we obtain the total indicated rolling work, as far as this can be calculated. The friction and acceleration losses vary, according to the kind and type of the mill engine, from about 15 per cent to about 50 per cent. To the total indicated work, calculated as shown, an addition has to be made, taking care of the losses enumerated above (false bites, roll-slips, etc.). This figure, then, represents the total work necessary to roll an ingot and it can be used to determine the size of a mill engine or mill motor. Care must, however, be taken to multiply the unit power by the right total displacement, when computing the total net rolling work. When equation 7 is applied we have to use $V_d = \Sigma\,(A - a)\,L$, and when using equation 8 we must take $V_d = AL$ hyp. log. A/a. The results obtained are identically the same, as was shown previously.

For the application of formula 1 or 2 we must, of course, know the area of the section of the ingot before and after the different passes. The calculation of these areas can be carried through without much difficulty on three-high mills, since here the ingot fills out the passes almost completely; consequently the areas may be obtained from a working drawing of the rolls or from measuring the dimensions of the rolls proper by means of a caliper, taking then into account the springing of the rolls will give the areas as close and exact as necessary. A proposition entirely different from this one is the determination of the sections of an ingot going through a reversing mill. All that is exactly known is the height of the pass, which can be obtained from the roller gage. If then an arrangement is made to measure the length of the ingot after each pass, this length in connection with the height and the weight of the ingot gives a means to determine the width of the section (see Proceedings of the Engineers' Society of Western Pennsylvania, July, 1914, page 591). This method allows a closer calculation of the width than any one of the formulas for the computation of the spreading which have been published. One of these equations was derived by E. M. Scheld and appeared in *Stahl und Eisen*, 1910, page 415. The formula has been rejected in Europe for several reasons; it seems, however, that this is not known well enough in this country, because the equation has here been used to some extent for the calculation of the spreading (Proceedings of the Engineers' Society of Western Pennsylvania, Nov., 1913, and July, 1914).

It must be stated that the formula does not and can not check with results obtained from actual tests under all conditions. It reads

$$B = \frac{du \sin a}{h}$$

where

B denotes spreading,
d " draft,
u " arc of contact,
a " angle of rolling, and
h " height after pass.

Substituting for u its value, we have,

since $u = 0.017453\,Ra$,

$$B = \frac{0.017453\,Rad \sin a}{h}.$$

With this formula the figures given in Table 7 were calculated. No attempt has been made to select the data which have been used for the calculation, but they have been taken at random from tests made on three different rolling mills. Table 7 shows that Scheld's equation in general does not agree with results obtained by tests, but does so only under certain condi-

Table 7—Comparison of Spreading, Calculated (Column 6) and Measured (Column 7)

d in.	R in.	h in.	sin a/2	sin a	Spreading B, in. Calculated	Spreading B, in. Measured
1	2	3	4	5	6	7
3 13/16	11.75	8.75	0.28445	0.54537	1.61	0.68
3 13/16	11.75	8.75	0.28445	0.54537	1.61	0.70
2	14.375	19.5	0.18650	0.36650	0.20	0.50
1¼	14.375	18.25	0.14745	0.29237	0.09	0.20
1⅜	14.375	16.5	0.17445	0.34366	0.18	0.40
1½	14.375	15.0	0.16152	0.31592	0.15	0.60
1½	14.375	13.5	0.16152	0.31592	0.16	0.90
1¼	14.375	12.5	0.13229	0.26163	0.08	0.10
1⅜	13.25	17.5	0.18150	0.35674	0.17	0.25
1⅜	13.25	15.75	0.18150	0.35674	0.19	0.25
1⅜	13.25	14.0	0.18150	0.35674	0.22	0.25
1⅜	13.25	12.25	0.18150	0.35674	0.25	0.25

tions. The main objection against using Scheld's or any other equation for the spreading, so far published, is based on the fact that none of these formulas takes care of the temperature of the ingot. There is no doubt that at 2100 deg. Fahr. there will occur, under otherwise equal conditions, a spreading which is entirely different from that obtained at, say, 1900 deg. Fahr. As long, therefore, as there is no formula at hand which takes care of the influence of the rolling temperature, it is better to try to determine the spreading by such means as mentioned above. The data thus obtained by a careful and experienced observer are of more positive and scientific value than those obtained by a calculation carried through with an incomplete formula.

The unit power requirements: that is, the hp.-sec./cu. in. or the engine coefficients which have been calculated from tests on different rolling mills, are comparable only when we know the rolling temperature of the ingots. The exact temperature, however, cannot be determined precisely with the two kinds of pyrometers in general use for this purpose. With an optical as well as with a radiation pyrometer, reliable re-

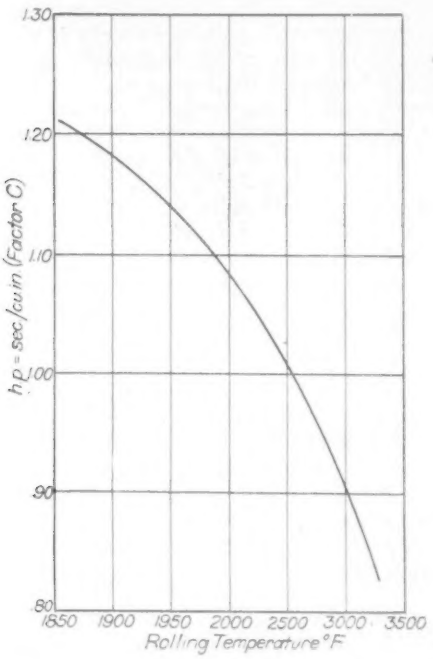


Fig. 9—Relation between Factor C and the Rolling Temperature

sults can only be obtained when the readings are taken by a well trained, experienced man, because there are too many points to be taken care of which can only be discovered by continuous practice. Besides, this personal element, the deviation from black-body condition, for which these instruments are calibrated, must be considered. For the determination of this deviation several optical laws are applied, but these laws only consider radiation from blank smooth surfaces. The correction to be added to the observed temperature, therefore, may vary considerably according to the law applied for the calculation of this correction but also according to the condition of the surface of the ingot, since this surface is never blank and smooth entirely, but covered more or less with iron oxide. The differences in per cent to be added for the correction of the observed temperature may be seen from the following:

Prof. Shook of the University of Illinois published in *Metallurgical and Chemical Engineering* of Sept., 1912, a table containing the corrections to be added. His calculation is based on Wien's "law of distribution." The corrections increase steadily, amounting to 4 per cent at 600 deg. C. and to 11 per cent at 2000 deg. C. The application of the Stefan-Boltzmann law gives a constant correction of 5 per cent for iron oxide and of about 30 per cent for blank iron. Taylor's correction amounts to only 4 per cent for a surface covered with oxide scale.

It might be suggested that the data sheets giving results of mill tests should contain not only the corrected temperature, but also the observed temperature and, besides, in order to complete the data, reference should be made to the kind of pyrometer used and the method of correction applied. The justification of this statement may be found in the following example:

Suppose the average rolling temperature of an ingot is given as 2000 deg. Fahr., while the average rolling temperature of another ingot is given as 2050 deg. Fahr. The unit power requirements of the two ingots, however, are the same. Now, it is evident that the hp.-sec./cu. in. for the ingot with a temperature of 2050 deg. Fahr. cannot be the same as those for the ingot having a temperature of 2000 deg. Fahr., other conditions, of course, being equal (see Fig. 9). If the data sheets would contain a statement in regard to the type of pyrometer used and the method of correction applied, we would see that, although a Fery pyrometer was used in both cases, the temperature of the second ingot was corrected by means of Wien's law of distribution and the temperature of the first ingot by Taylor's method. The observed temperature in both cases was 1920 deg. Fahr. (1050 deg. C.), which explains the identity of the figures for the unit power requirements.

It must be kept in mind, that, even if all precautions have been taken, the figures given for the temperatures are not strictly correct (for the reasons mentioned above) and are only of a relative value. They can, however, be used for comparison.

The temperatures for *C*, Fig. 9, are corrected by means of Wien's law of distribution. They are based on observations made with Fery pyrometers.

There is a possibility of overcoming the trouble arising from the use of optical or radiation pyrometers and the ensuing application of different methods for the correction of the observed temperature, that is, by using a contact pyrometer. Such an instrument is simply a Le Chatelier thermo-couple fitted by means of a special contrivance for the use on ingots or billets. If the cold junction is kept cool enough, the pyrometer will give the exact temperature of the ingot, without having to add doubtful corrections, since the only correction to be made would be that for the cold junction temperature, which, in our case, may be entirely neglected.

It was tried in the foregoing to show that the controversy between the adherents of the two equations for the calculation of the displaced volume is entirely unfounded, because both formulas give the same result if correctly applied. The interdependency of the two equations was proved by several examples. A formula was derived for the calculation of the net rolling work, based on the equation $V_d = (A - a)\,L$, which formula can easily be altered into a form to suit equation $V_d = AL$ hyp. log. A/a. It was then shown that the application of a formula for the calculation of the spreading is not warranted, as long as this formula does not take care of the rolling temperature; finally, it was pointed out in what way this temperature should be obtained in order to avoid the addition of doubtful corrections.

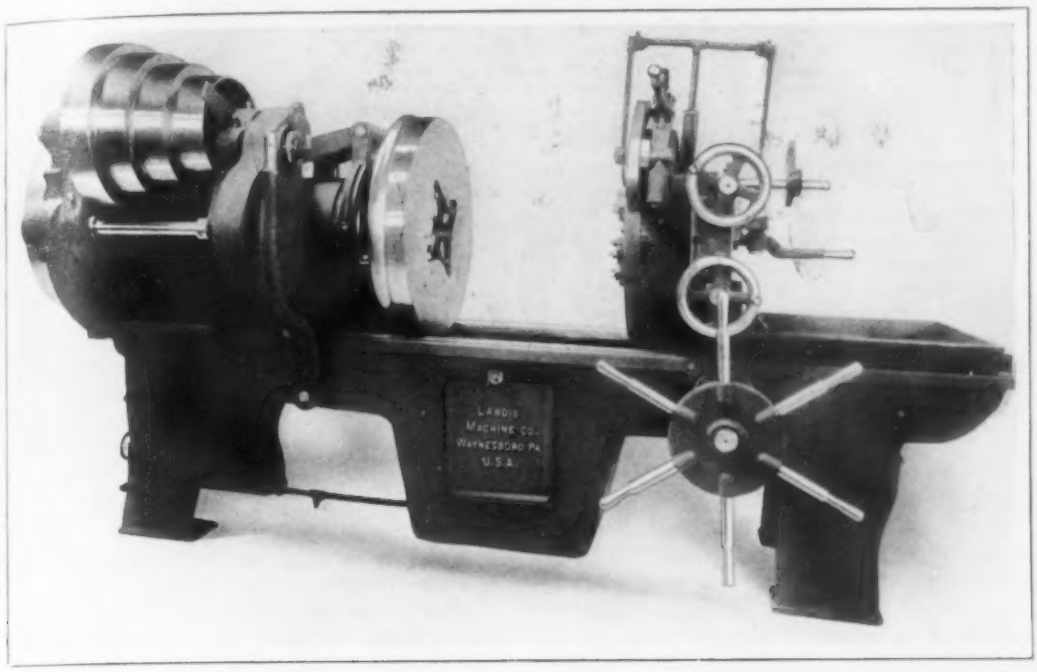
Ship Construction in the United States

United States shipyards had under construction or contract at the beginning of the fiscal year July 1, 1915, according to data obtained by the Bureau of Navigation, Department of Commerce, 65 steel merchant vessels of 298,426 gross tons. This is the largest amount of work at the corresponding time since July 1, 1907, when 134 such vessels of 403,473 gross tons were building or contracted for. On the seaboard, however, the steel merchant construction, 60 vessels of 288,701 gross tons, is greater than in any previous year, the nearest being 63 of 273,865 tons in July, 1901.

Of the vessels now building, 21 are bulk oil carriers of 154,056 gross tons, 6 colliers of 25,475 gross tons and 5 passenger steamers of 17,000 tons, the rest being cargo boats. For the United States Navy, excluding submarines, 27 vessels are listed of 287,382 tons displacement.

Pipe Cutting and Threading Machine

A line of pipe cutting and threading machines equipped with the builder's stationary type die head has been placed on the market by the Landis Machine Company, Waynesboro, Pa. The special feature claimed for this type of head is the ability to cover a wide range of pipe sizes with only one set of chasers. This construction enables the machine to be adjusted for the different sizes of pipes very readily, as the die head and gripping chuck have universal adjustments. Reaming attachments and cutting-off tools are furnished for the machine so that it is possible to thread, ream and cut pipe in one continuous operation.



A New Pipe Threading and Cutting Machine With Special Die Heads for Handling Pipe Ranging from 1 to 4 In. in Diameter

The die head consists of either four or six chasers, depending on the size, which are tangentially inclined to the work to agree with the pitch of the thread. Each chaser is gripped by a clamp which engages the upper side of the dovetail on the back of the tool and seats it firmly in the holder. The chasers are milled from flat bar steel and hardened throughout their entire length. When the chasers become dull they are sharpened at the cutting end and moved forward in the holders. The heads are locked within themselves and are graduated to correspond with the various sizes within their respective ranges.

The machines are belt driven by a 3½-in. belt, and eight speed changes can be obtained. The equipment furnished with the machines includes two die heads, pump, countershaft, wrenches, reaming attachment, cutting-off tools, length gage, two sets of steel chasers and pipe and nipple grips.

Lake Superior Mining Institute Meeting

The twentieth annual meeting of the Lake Superior Mining Institute will be held on the Gogebic Range on Monday, Tuesday, Wednesday and Thursday, Sept. 6, 7, 8 and 9, with headquarters at Ironwood. Business sessions will be held at Ironwood and at Crosby. The First-Aid Demonstration will be held at Ironwood, after which excursions are planned to points of interest on the range. One day is to be spent on the Cuyuna Range, and a visit will be made to the Minnesota School of Mines and the State Fair, where the meeting will close. A. J. Yungbluth, Ishpeming, Mich., is secretary.

Large Multiple Punching Machine

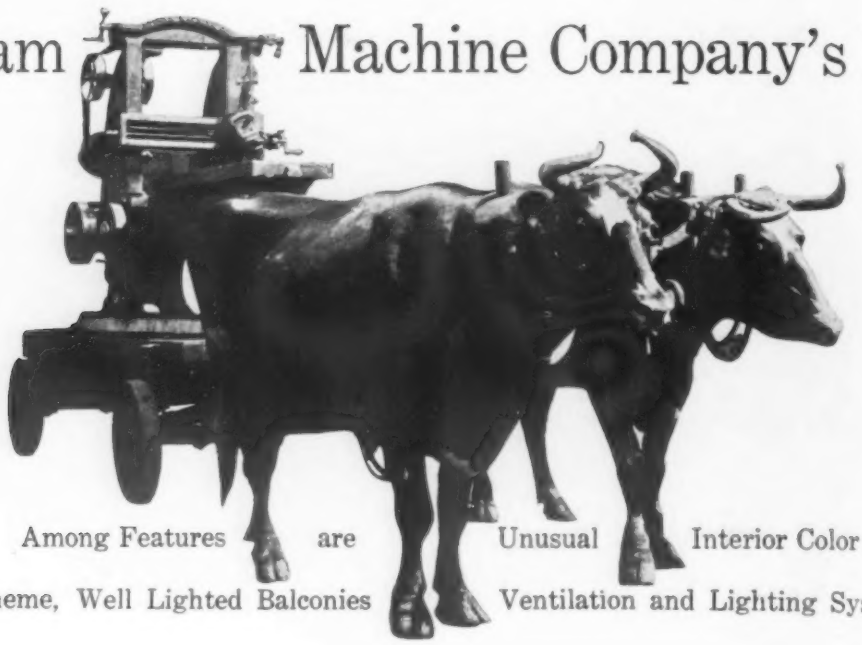
L. H. Bertsch & Co., Cambridge City, Ind., have recently designed and built a large multiple punching machine. The special features of this machine are the use of a cored or box section frame and a special type of coupling for the gagged punches.

The head of the machine contains twenty punching units, each having a gag so that any desired number of punches from one up to twenty can be used or disengaged at will. The punches with the exception of four are spaced too closely for standard couplings to be used and for that reason a special type of coupling on which the builders have applied for a patent is employed. Both types of couplings

A Multiple Punching Machine With Capacity for Twenty Units and Provision for Using any Desired Number

are shown in the accompanying illustration, as well as the cored or box section frame and the massive proportions of the machine.

Putnam Machine Company's Plant



Among Features are Unusual Interior Color Scheme, Well Lighted Balconies Ventilation and Lighting Systems

THE new plant of the Putnam Machine Company, Fitchburg, Mass., is now completed, excepting that not all of the equipment has been installed, though the machine shop, foundry and pattern shop are in operation. As the accompanying illustrations show, the buildings in all of their details are of the latest type for economical production and for the general well being of the employees. Architecturally the works are attractive. The materials are brick and concrete, the scheme being carried out consistently even to the extent of facing with brick the solid concrete of the four-story pattern building to conform with the wall effect of the other structures. The plant is of more than usual interest because the company is controlled by Manning, Maxwell & Moore, Inc., New York City.

The plant is located west of the old Putnam shops, adjacent to the main line of the Fitchburg division of the Boston & Maine Railroad. The office building is on a new street which will be constructed in the near future, and is very close to the mercantile center of the community. The works are laid out as a quadrangle, with the office, pattern shop and forge shop on the proposed thoroughfare and the machine shop, foundry and power house at the rear. From the railroad siding three spur tracks enter the works, one to carry coal to the power plant, another passing under the crane in the yard where foundry materials are stored and thence on into the main manufacturing bay of the machine shop, and the third entering the same building and serving the bay which is devoted to erecting and shipping.

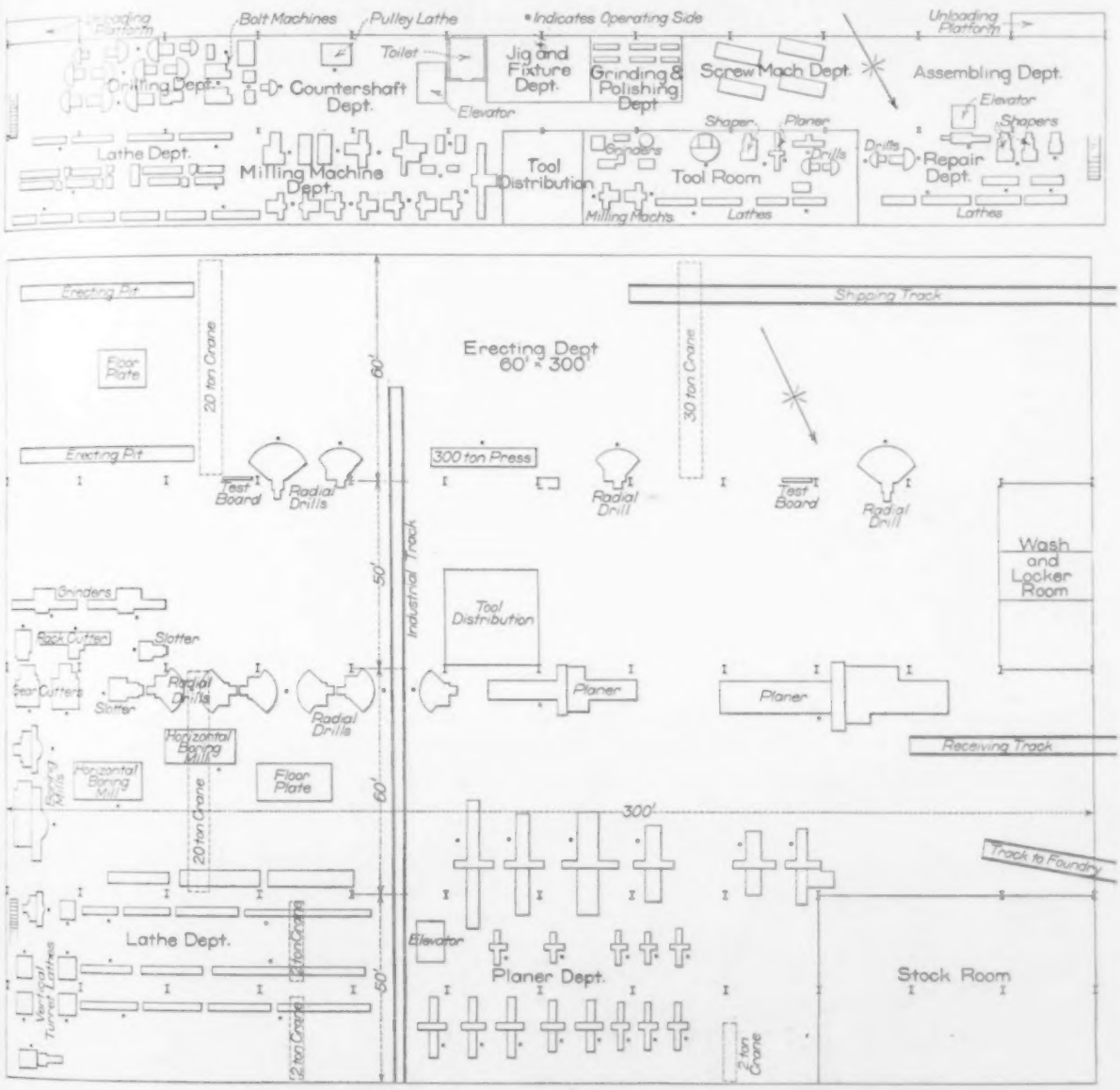
The machine shop building is one of the finest in existence. It is of magnificent proportions, in height as well as on the ground. The steel sash windows occupy a very large percentage of the wall space, and a suitable proportion of the sashes, at top and bottom, are arranged to swing open, the control being from the floor by a mechanical system. Naturally the ventilation is very complete. The lower panes are of plain glass, that above being

The Main Machine Shop Showing the Gallery Shop along the North Wall

clouded, so that the intensity of the illumination is modified. An unusual feature of the interior of the building is the color scheme. The walls and columns to a height of 6 ft. are a chocolate brown which can show little evidence of soiling, while above the tint is a pleasant pale yellow, with the ceiling a mill white. The effect is most desirable, both artistically and physically, in the effect upon the eyes.

The building is 220 ft. wide and 300 ft. long, and, while constituting one great room, is divided longitudinally into four sections. That at the north has a balcony where are located those manufacturing departments which require the lighter types of machinery. At the west end of this section is a mezzanine floor which will be used for storing rough and finished material. At each end of the balcony there projects a loading platform for the convenience of the cranes, and two capacious elevators connect this story with the main floor. The balcony is a large shop in itself, measuring 50 x 300 ft. It is exceptionally well lighted by side windows and those of the sawtooth roof, which extends over it the entire length of the building. The main floor of this bay is devoted to the medium-sized machine tools, which are served by two hand-operated traveling cranes, one of which is equipped with an electric hoist.

The next section of the building is a broad crane bay which has a 20-ton traveling crane. Here the very heavy machines are located. The south bay, which is of the same proportions, is devoted to the erecting and shipping departments. The intervening section, which is given over to moderately heavy equipment, is covered with a roof of long angled sawteeth. The erecting floor has a 20-ton and a 30-ton crane. The railroad enters at the westerly end, space being provided for four cars. Another spur enters the other crane bay. An industrial railway extends across the building, connecting the various sections and supplementing the convenience of the cranes in transferring machinery and its parts.



Layout of the Machines in the Main Shop with that for the Gallery Above

The foundry is just as modern in every detail. It is 120 x 200 ft. Its cupolas have a capacity of 25 tons per hour. The floor is extraordinarily well lighted, the illumination from the side windows of the walls and of the monitor, being supplemented by that from two steep pitched skylights which extend practically the entire length of the roof of the monitor. Over the brass department is a mezzanine floor, which will be used for the storage of patterns and cores for that department.

The charging floor, which is shown in one of the illustrations, is of somewhat exceptional interest. The space devoted to stock storage is divided into bins, which are filled by the crane from the yard below. The loads on the scale platforms are regis-

tered on great dials located at a central position. In making up a charge for the cupola the workman places his buggy on a scale platform and watches the dial as he fills the vehicle with the different materials. The chances of error in the mixture are reduced to a very small factor. The cupolas are provided with mechanical charges. On this floor is also located the blower which performs the dual task, as desired, of propelling indirect heat from a hot water coil chamber into the foundry, or, its rotation being reversed, acting as an exhaust, removing the smoke and dust through the openings in the long drum that extends along the top of the room. The foundry also has direct hot water heat, and this method is employed in heating the machine shop and other buildings.

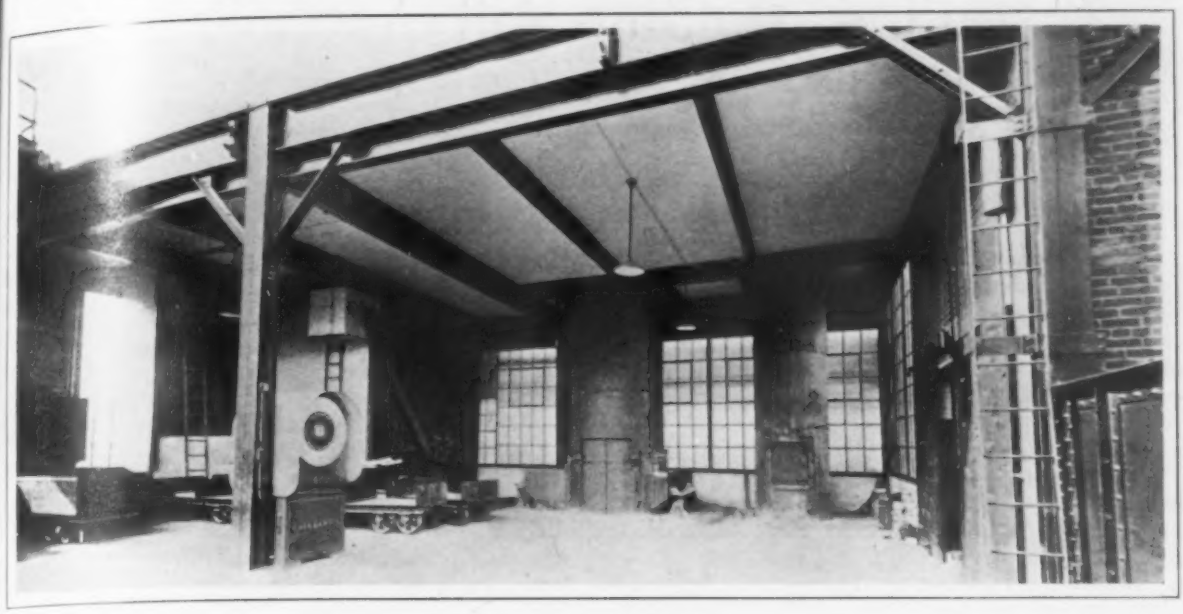
A feature of the piping in the machine shop is worth mentioning. The columns are fabricated as I-beams and the channels are utilized to contain the heating coils. The power house is divided into two sections, the boiler room, in which are installed two Babcock & Wilcox watertube boilers, and the room in which is located the electrical power equipment. As has been suggested a hot water system heats the buildings. In the boiler room are recording instruments which give the temperature of the water going into the factory, the temperature of the outside atmosphere and the temperature of the buildings themselves, a combination which, together with the regulating apparatus of the boilers, promises a consistent control of the heating.

The system of artificial illumination does away almost entirely with individual small lamps. The lights are of large power and are distributed liberally. They are of the nitrogen-filled type. From actual test it has been found that the plant is as well illuminated at night as in the daytime, with hardly a shadow anywhere. The company purchases its power from the Connecticut River Company and transformers reduce the current to the desired voltage.

The management has devoted a good deal of thought to the layout of the offices. The drafting room is at the front of the structure and the manager's office is at the rear, where it is near the works. At this end also is the office of the pay clerk, arranged so that his transactions with employees are not observable from the other departments. The purchasing agent's office is directly at the main entrance. The large vault is easily accessible to those departments which use it, the drafting room, the stenographers and the main office.

The old and the new Putnam shops, now standing side by side, constitute a very striking example of the progress that has been made in factory design. When the old shops were built they were considered models of mill architecture, and their arrangement the best that could be procured to secure industrial convenience. In those days the economies of the mechanical handling of materials and products could not have been carried out even had they been realized, for electric power was unknown, of course, and the application of steam power for such purposes was hardly better understood. A wooden jib crane was about the latest word in the moving of heavy things. In fact, the present day methods of doing this work without the aid of manual labor do not, after all, date back so very many years. Because of the peculiar arrangement of the main machine shop of the old plant a yoke of oxen has played a somewhat important part for years. The bays run across this building. The machinery constructed is heavy, and it is essentially impossible to move the larger parts from one bay to another within the building. A heavy gear, for example, must be hauled from one bay into the yard and then delivered to another bay for the next operation. The jib crane, a heavy cart and the oxen have constituted about as good a way to accomplish this task as any, unless it were a motor truck, and the new management did not consider it worth while to thus replace the animals because the conveniences of the new works would soon dispense with the necessity of either. The contrast between the old and the

A General View in the Foundry Showing the Overhead Traveling Crane and the Ventilating Ducts



The Charging Platform

new is almost startling. In the new shops and foundry everything is done by power excepting the operation of the industrial railway, the smooth running trucks of which make the occasional manual labor easy. Cars from the railroad deliver material to the foundry and machine shop. Cranes do all the rest of the work. The oxen are now a part of the past.

The pattern building is a model in its class. The first floor is divided into two sections, that next the foundry for the carpenter shop and the flask department, the other for the storage of large patterns. The second floor is devoted exclusively to pattern making, and the two upper stories to pattern storage. An elevator operates on the outside of the building, to facilitate the handling of lumber and patterns.

High Phosphorus Slag from Open-Hearth or Electric Furnaces

A process for producing a high grade steel and a slag containing a high percentage of soluble phosphates in an open-hearth or an electric furnace is patented (U. S. 1,137,681—April 2, 1915) by Albert Vögler of Dortmund, Germany. In practice it has been found that the chances of obtaining a high percentage of soluble phosphates are most favorable in the first part of the refining process and that this is always lost toward the end or in the finishing of the charge.

The object of the patentee's process is to convert the phosphoric acid into its soluble form in the same hearth while making steel of any desired quality without removing the metal from the furnace prior to finishing or interrupting the process in any way. The new process retains the slag on the metal bath until rich in phosphoric acid when it is removed by blowing while the metal bath remains in the furnace for the refining process. This is done in a tilting furnace in which the bath may be brought to any level at any time so that the slag can be easily removed with a blast and the metal retained for further refining. The tilting and blowing are effected simultaneously. The claim is made that the slag from a 60-ton charge can be entirely removed in less than 8 min. This slag is termed the "finished slag" while that which remains in the furnace after the metal is tapped is called the "finishing slag."

Hitherto the finishing slag, containing a certain quantity of phosphates, had to be removed from the furnace. By this new process the finished metal may be tapped from under the finishing slag, thus making it possible to recover the phosphates in the finishing slag by using it to enrich the content of phosphates in the primary slag of the subsequent charge for producing the finished slag of this charge.

Apart from the recovery of the phosphates in a high grade form and the production of a high quality of steel, the losses in time, heat and iron due to the usual tapping or coating of the slag, are entirely overcome because the slag remains in the furnace.

Pneumatic Close-Quarter Drilling Machine

The Ingersoll-Rand Company, 11 Broadway, New York City, has recently added a new pneumatic tool for close-quarter drilling, reaming, tapping, etc., to its Little David line. The tool is intended particularly for working in cramped or confined positions where the regular four-piston reciprocating type, which was illustrated in THE IRON AGE, Jan. 22, 1914, cannot be used. This, it is emphasized, is possible as the distance from the end of the casing to the center of the spindle is only 1 5/16 in. The motor is of the three-cylinder design with a rotary type valve. The crankshaft is operated by three ratcheted levers which connect the pistons directly to the drill spindle, the pinion on this shaft serving to drive the valve through gears. The use of this construction, it is explained, produces practically no strain on the crankshaft as the power is transmitted directly from the pistons through levers to the ratchet spindle. The ratchet is of the triple type, one of the ratchets being engaged with the spindle at all times, an arrangement which is relied upon to give a constant pull on the spindle. The casing is divided and the loosening of the cap screws permits ready access to the moving parts. This construction enables one of these tools to be dismantled and completely reassembled in approximately ½ hr. A No. 4 Morse taper socket is included in the equipment. The capacity of the drill is 3 in. for drilling and 1 in. less for reaming and tapping at an operating speed of 150 r.p.m.

The Atlas Drop Forge Company, Lansing, Mich., which occupied a new plant only last October, is now completing an addition 60 x 150 ft. to house its heat treating, smithing and cold trimming departments already crowded out by the rapid growth of business. The increased space thus afforded in the forge shop will now permit an equipment of thirty steam hammers ranging in capacity from 1500 to 10,000 lb., six board drop hammers from 600 to 1000 lb. and five hydraulic presses with capacity from 600 to 2400 tons.

Electric furnace production of pig iron in Italy in 1914 was 4500 metric tons, which compares with only 160 tons in 1913 and 2500 tons in 1912.

Installing Rolling-Mill Anchor Bolts

Use Made of Tapped Holes and a Crane —Proportions of Eye Bolts Employed— Tunnel in Foundation to Provide Access

BY ARTHUR CONNLEY

The subject of the installation of anchor bolts in rolling-mill foundations is one that justifies special consideration. One reason for this is that a great many anchor bolts are usually required for a rolling mill foundation. Another is that sometimes the anchor bolts for such service are very long and of large diameter, and consequently unless provisions are made for their economical installation there is a possibility of a waste of time and money. In the paragraphs which follow some suggestions will be given for methods whereby these bolts can be handled effectively.

Large anchor bolts should have their upper ends drilled and tapped, as shown in Fig. 1, so that eye bolts can be temporarily associated with them, as shown in Fig. 2, to facilitate handling. The usual practice in the United States is to tap all anchor bolts of diameters greater than 3 in. Sometimes bolts considerably smaller than 3 in. in diameter have holes tapped in them. It will be found convenient where a crane is available to have all bolts greater than 1½ in. in diameter tapped as suggested in Fig. 1 for an eye bolt. With the anchor bolts thus arranged for the accommodation of an eye bolt, a crane can be utilized in installing them, as suggested in Fig. 4. If no crane is available, a set of chain blocks can be used. A large mild steel anchor bolt is quite heavy. For instance, one 10 ft. long and 3 in. in diameter, weighs approximately 240 lb., and obviously is an awkward thing to insert in a casing hole in the foundation and to turn into the nut in the anchor plate, unless the eye bolt provision suggested is adopted.

The proportions of a series of eye bolts that have been found satisfactory for handling foundation bolts is shown in the accompanying table in connection with Fig. 6. The table also indicates the safe strengths of these eye bolts at the root of the thread, S_r, assuming a safe unit strength of 10,000 lb. per square inch and the strength of an unstudded chain, S_c, made up of round mild steel rod of the same diameter as the material of the eye bolt eye. Drop-forged eye bolts of about the proportions shown can usually be purchased, but if they cannot, satisfactory eye bolts of about the dimensions indicated can be forged by the smith in any plant.

In determining the size eye bolt to use for handling an anchor bolt there is but one factor that need be considered. It is only necessary to select an eye bolt of such a diameter so that it will safely sustain the weight of the anchor bolt. Then the anchor bolt should be drilled and tapped accordingly. The procedure can best be illustrated by an example.

Example.—What size eye bolt should be used for handling a mild steel anchor bolt, 2½ in. in diameter, 10 ft. long, shown in Fig. 1? *Solution.*—Referring to a table of weights of round iron bars, such as can be found in any mechanical engineers'

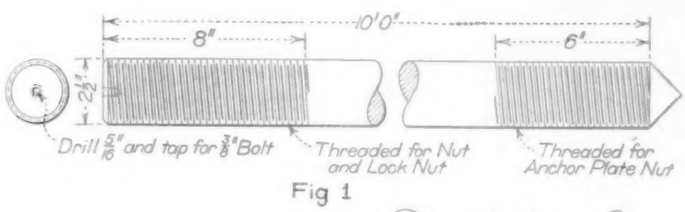


Fig 1

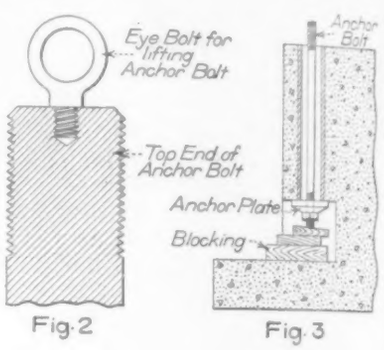


Fig. 2 Fig. 3

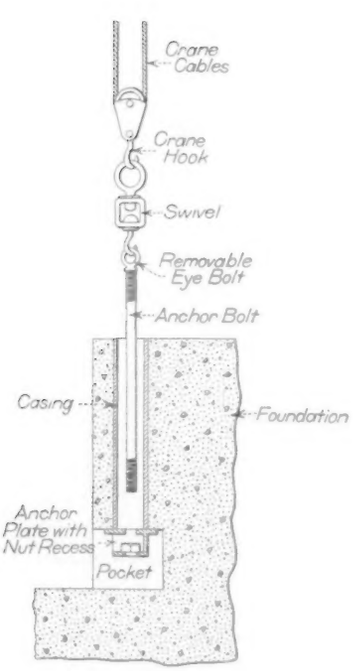


Fig. 4

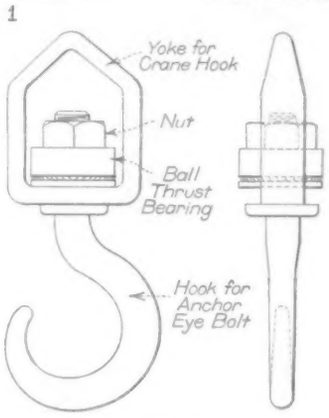


Fig. 5

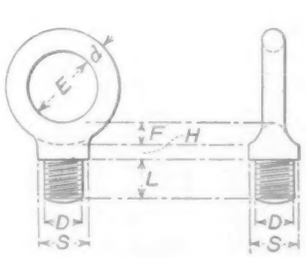


Fig. 6

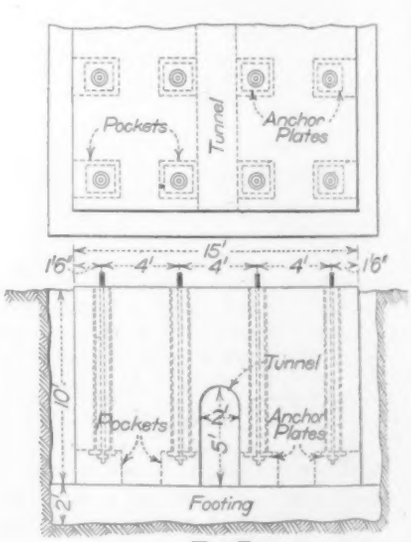


Fig. 7

Group of Drawings Showing the Use of a Crane and Eye Bolts for Setting Anchor Bolts in Place in Rolling-Mill Foundations

or structural steel handbook, it will be ascertained that a 1-ft. length of 2½-in. round iron bar weighs 16.69 lb. Hence 10 ft. will weigh 166.9 lb., or say, 170 lb. Now referring to the values in the safe strength column of the table it will be found that a ⅜-in. eye bolt, the smallest size that is adapted for ordinary use, will carry 677 lb. It is therefore, obviously, large enough for handling this 170-lb. bolt. The anchor bolt should have its upper end drilled and tapped to accommodate the eye bolt, in accordance with the dimensions indicated for a ⅜-in. eye bolt in the table.

If a table showing the weights of round iron bolts is not available, the weight of any anchor bolt can be computed by using the values given in the following paragraph. The size of tap drill to use for any diameter standard eye bolt can be found in any table giving the properties of standard U. S. bolt threads.

Some properties of round wrought iron rods, the knowledge of which is found convenient in making anchor bolt computations, are as follows: Specific gravity is 7.7. The weight per cubic foot is 480 lb. The weight per cubic inch is 0.2779 lb. The weight per foot of any wrought iron rod is $D^2 \times 2.618$, where D is the diameter of the rod in inches.

The method of installing anchor bolts where a crane is available is outlined in Fig. 4. An eye bolt is screwed into the previously drilled and tapped end of the anchor bolt which it is desired to insert. Then the crane hook is engaged in the eye-bolt eye and the anchor bolt is raised and transported to a point over the casing in which it is to be installed. It is then lowered into the casing as suggested in Fig. 4. The anchor plate should be in place at the bottom of the casing and if the anchor plate has a recess the nut should be in the recess as shown in Fig. 4. Then the bolt is lowered into the nut and is turned by using as a lever a bar passing through the eye-bolt eye, and thus screwed down into the nut. The nut resting against the bottom of its recess will then prevent the bolt from dropping down into the pocket, and the eye bolt can then be removed. Usually the machine bedplate, which is not shown in Fig. 4, is in position before the anchor bolts are installed, but this is not necessarily the case. Where the bed plate of the machine is in position on the foundation and the anchor bolts are dropped through the bolt holes in it, a nut can, prior to the insertion of the eye bolt, be run on the top of the anchor bolt. Such a nut will then prevent the anchor bolt from dropping down into the pocket.

A swivel hook should be provided where a crane is to be used in installing anchor bolts. A simple swivel is shown in Fig. 4, but where a considerable number of bolts are to be placed, a ball-bearing swivel, constructed somewhat on the lines suggested in Fig. 5, will be found an economical appliance. The swivel should turn with a minimum of friction, so that the bolt can be screwed into the nut in the anchor plate with little effort. The friction of a swivel not provided with ball bearings is apt to be disagreeably great.

Nut recesses in anchor plates prevent the bolt from dropping to the bottom of the pocket. For example, if an anchor bolt is installed in an anchor plate like that of Fig. 3, which has no nut recess, the tendency of the bolt is to drop down to the bottom of the pocket, which is in some cases undesirable. Where such is the condition, the bolt must then be blocked up in position as illustrated. Where the anchor plate has a nut recess, as in Fig. 4, the anchor bolt is thereby prevented from dropping down into the pocket, and the necessity of blocking to hold it up is eliminated.

Anchor bolts with their lower ends slotted for cotters can be installed in minimum time, because it requires much less time to insert a cotter in the slotted end of a bolt than it does to screw the end of a threaded bolt into a nut. This is particularly true if the bolt or nut is rusty or if the thread of either is imperfect. However, where bolts with cottered ends are used some arrangement should be provided in the anchor plate to engage the cotter and so support the bolt, so that blocking like that of Fig. 3 will never be necessary to hold the bolt in place. A recess or hook can readily be cast in the anchor plate somewhat as suggested in Fig. 4, to hold the cotter and thus support the bolt.

A tunnel through a foundation to permit access to the anchor plate pockets is shown in Fig. 7. It is always desirable in large foundations that the nut on the lower end of each anchor bolt be accessible, and this can always be arranged by providing pockets which open either to the outside of the foundation or to a tunnel passing through it, as shown in Fig. 7.

The advantages of accessible pockets are that they permit the replacement of a nut or bolt at any time, and that they furthermore permit the cleaning of the casing holes or casings. Casings in a foundation are always liable to become partially filled with dirt during the construction of the foundation and prior to the installation of the machine on it. This often occurs, regardless of the precautions that may be taken to guard against it. If no pockets are provided at the lower ends of the casings, or if the pockets are inaccessible, it is very difficult or oftentimes impossible to clean such casings. Where accessible pockets are provided it is not necessary to place the anchor bolts and their lower nuts until after the foundation is finished and the machine bedplate installed. The casings can, where pockets are accessible, be readily cleaned at any time prior to the placing of the bolts in them, or at any subsequent time, for that matter, provided that the bolts are first removed temporarily.

Properties of Eye Bolts, Design Shown in Fig. 6

D	E	S	L	H	F	d	n	S_r	S_c
⅜	2	¾	⅝	3/16	⅜	¼	16	677	750
½	2¼	1	¾	¼	½	5/16	13	1,257	1,172
⅝	2½	1¼	1	5/16	⅝	7/16	11	2,018	2,296
¾	2⅝	1 7/16	1⅛	5/16	11/16	½	10	3,020	3,000
⅞	2½	1 11/16	1⅜	⅜	¾	⅝	9	4,194	4,687
1	2⅜	1⅞	1½	7/16	⅞	¾	8	5,509	6,750
1⅛	2⅞	2⅛	1⅝	½	1	13/16	7	6,931	7,921
1¼	3	2⅜	1¾	½	1⅛	⅞	7	8,899	9,188
1⅜	3⅛	2⅝	1⅞	9/16	1 3/16	1	6	10,541	12,000
1½	3¼	2¾	2	⅝	1¼	1 1/16	6	12,938	13,546
1⅝	3⅜	3	2⅛	11/16	1⅜	1⅛	5½	15,149	15,187
1¾	3½	3⅛	2¼	⅝	1½	1¼	5	17,441	18,750
1⅞	3⅝	3½	2⅜	13/16	1⅝	1 5/16	5	20,490	20,671
2	3¾	3¾	2½	⅞	1¾	1⅜	4½	23,001	22,686

n = Threads per in.
S_r = Safe strength at root of the thread in lb., assuming a safe unit strength of 10,000 lb. per sq. in.
S_c = Strength of an unstudded chain made from round mild steel rods d in. in diameter in lb.

New Steel Warehouse for Eastern Territory

Large Tiled Roof Steel Structure Now Occupied by Joseph T. Ryerson & Son—A Building Within a Building for Special Storage

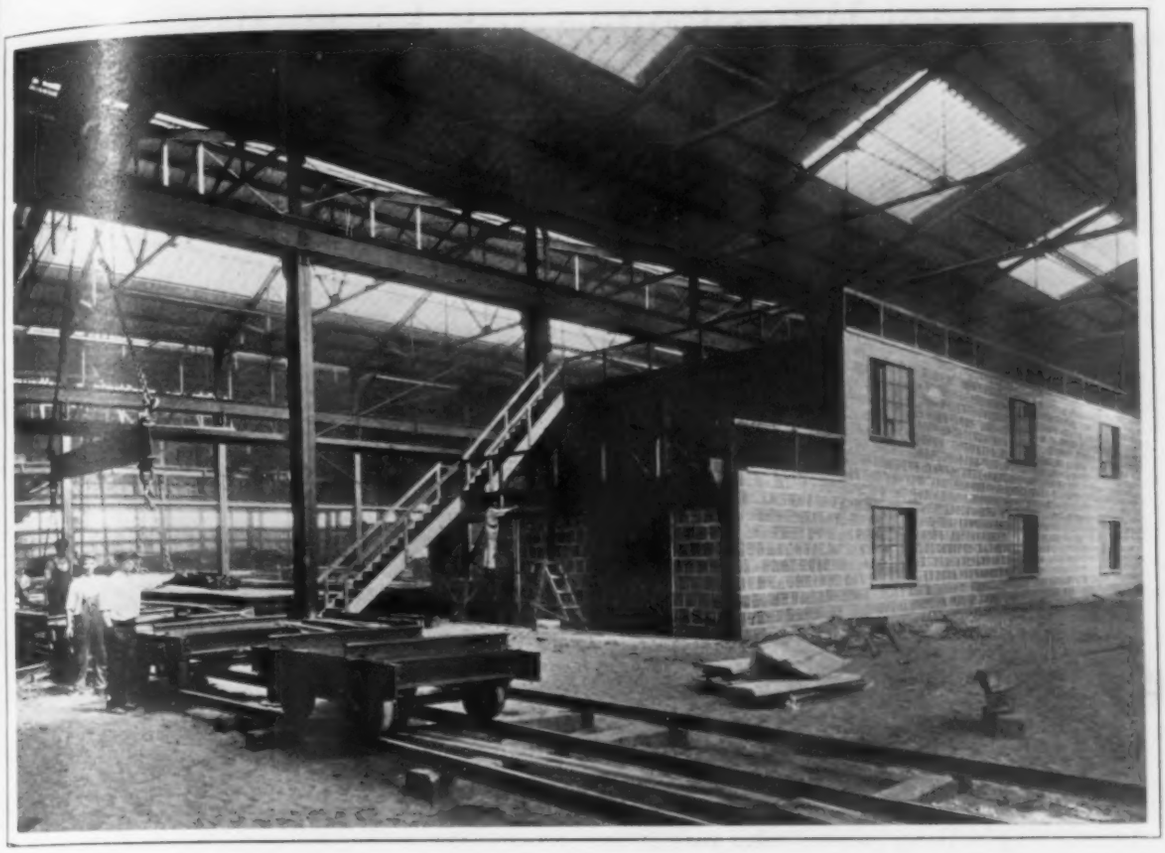
Joseph T. Ryerson & Son are now occupying a newly constructed warehouse of 97,500 sq. ft. area, located on West Side Avenue, Jersey City, N. J. The building stands on a ten-acre plot through which passes a switch of the Central Railroad of New Jersey, and it is near the junction of the Hackensack River and Newark Bay, thus allowing transportation by both rail and water. Good roads, with no hills encountered en route to New York City, facilitate truck deliveries. The Morris Canal borders the property.

The plant consists of a mill-type building, 250 x 350 ft. in size, constructed of a steel skeleton framework, with corrugated steel siding and a cement tile roof. The roof has large skylight areas which provide an abundance of light for the various cutting operations and handling of material. While the roof is mainly of tiling, the gutters between the bays are of planking, covered with composition roofing, this construction being followed to obviate all possibility of leakage, particularly in winter, when snow and ice may accumulate in the gutters. In the buildings can be stored 30,000 tons of material.

The building is divided into four open spans or bays, each 250 ft. long. Two of these are 100 ft. in width and two 75 ft. The two 100-ft. spans are served by 15-ton, two-trolley hoist Niles cranes, and the 75-ft. spans by 10-ton, two-trolley hoist Whiting cranes. Each of the four bays is used for the handling of different lines of stock. One of the larger spans is entirely given over to the stocking and cutting of beams and channels. At the end of this span is a Ryerson high-speed friction saw, fed by power-driven roll tables. At the same ends of other spans, and arranged for an orderly progression of handling and cutting and shipping by rail or motor truck, are other machines, including a Cleveland heavy-duty double-side angle shear, fed by a roll table; a 10-ft. plate shear capable of shearing 1-in. plates; bull dozer; a 10-ft. sheet shear; a tube cutter, and a Kron automatic springless scale with a dial indicating up to 7500 lb. A wide passageway extends the entire length of the building parallel with the machines, enabling delivery trucks to load near the various machines. The railroad switch passes through the opposite end of the bays. In the second 100-ft. span are carried angles and bar stock for concrete reinforcing.

One of the 75-ft. bays is given over exclusively to the handling of U.M. and sheared plates carried in long lengths. The Cleveland punch and shear for cutting plate stock is so arranged that long lengths may be split to any desired length. The other 75-ft. span is specially designed for carrying miscellaneous material, including bar stock, galvanized, blue-annealed and special-finish sheets, rivets, bolts, washers, drills, reamers, etc., as well as bands and strip steel in coils. A feature of this bay is an inclosed warehouse, two stories in height. It is approximately 35 x 90 ft., and constructed of hollow tile. It has overhead steam

Three of the Bays in the New Jersey City Warehouse of Joseph T. Ryerson & Son. Plates, Angles, Beams and Channels Confined to Separate Bays



Inclosed Space in Ryerson Warehouse for the Storage of Sheets and Materials Which Must Be Protected from Rust and Discoloration. Railroad Switch in Foreground

radiators. In it are stored galvanized sheets, shafting, reamers, drills, and other materials which are susceptible to discoloration or rust. Material can also be stored on the roof as there is ample room between it and the crane girder. The second story recedes at one end, creating a platform to facilitate handling material.

On the railroad tracks within the plant, sixteen railroad cars can stand at one time, if that should be necessary. Adjoining the warehouse is a brick building containing offices, storage room for files, lavatory, and boiler room, the latter supplying heat for the offices and the inclosed storage space.

Shell Turning and Manufacturing Lathe

Fairbanks, Morse & Co., Inc., New York City, has designed a lathe which is intended especially for operation by non-skilled labor. While the machine is particularly suitable for turning and boring operations on projectiles ranging from 3 to 6 in. in diameter, it can also be used for general manufacturing work. The only change necessary in transforming the lathes from one class of the work to another is the changing of the spindles.

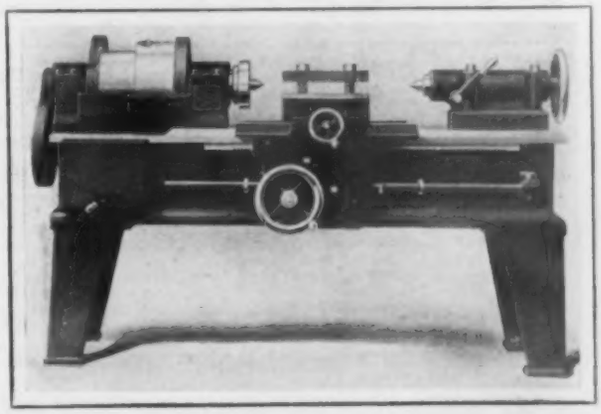
The bearings in the headstock are ring oiled, the chambers being large enough to hold a considerable quantity of lubricant. The spindles, which are bored to conform to the Morse No. 5 standard taper, are solid unless otherwise ordered. If desired the spindles can be bored to accommodate a 3-in. shell, and by slightly tapering the front ends it is possible to equip the lathes with expanding arbors. The gearing is of steel cut from the solid, and by shifting a lever in the gear box three feeds ranging from ⅛ to 1/32 in. are obtained, other feeds being furnished if desired.

The countershaft furnished is of the two-speed type and runs at a speed of 110 r.p.m., which gives a cutting speed of 68 ft. per min. Power longitudinal feed with automatic stops in both directions is furnished for the carriage.

The following table gives the principal dimensions and specifications of the lathe:

Swing over bed, in.	16
Swing over carriage, in.	10
Distance between centers, in.	28
Ratio of back gearing	6.25 to 1
Diameter of tailstock spindle, in.	3½
Travel of tailstock spindle, in.	8

The equipment regularly furnished with the lathes includes the countershaft and all of the



A Lathe for Turning and Boring Projectiles Ranging from 3 to 6 In. in Diameter Designed for Operation by Non-Skilled Workmen and also for Conversion into a Standard Heavy Duty Manufacturing Lathe

usual appliances, but if desired the lathes can be equipped with a special turret on the carriage, oil pan and pump, forming attachments, etc.

The Seneca Iron & Steel Company, manufacturer of black and galvanized steel sheets and corrugated formed products, Buffalo, N. Y., resumed operations in its mills on Monday, July 26, after a brief suspension due to some labor difficulties.

Design and Performance of Ball Bearings

What Is Involved in Such Bearings, in Shapes of Parts, Accuracy in Dimension and Consideration in Use

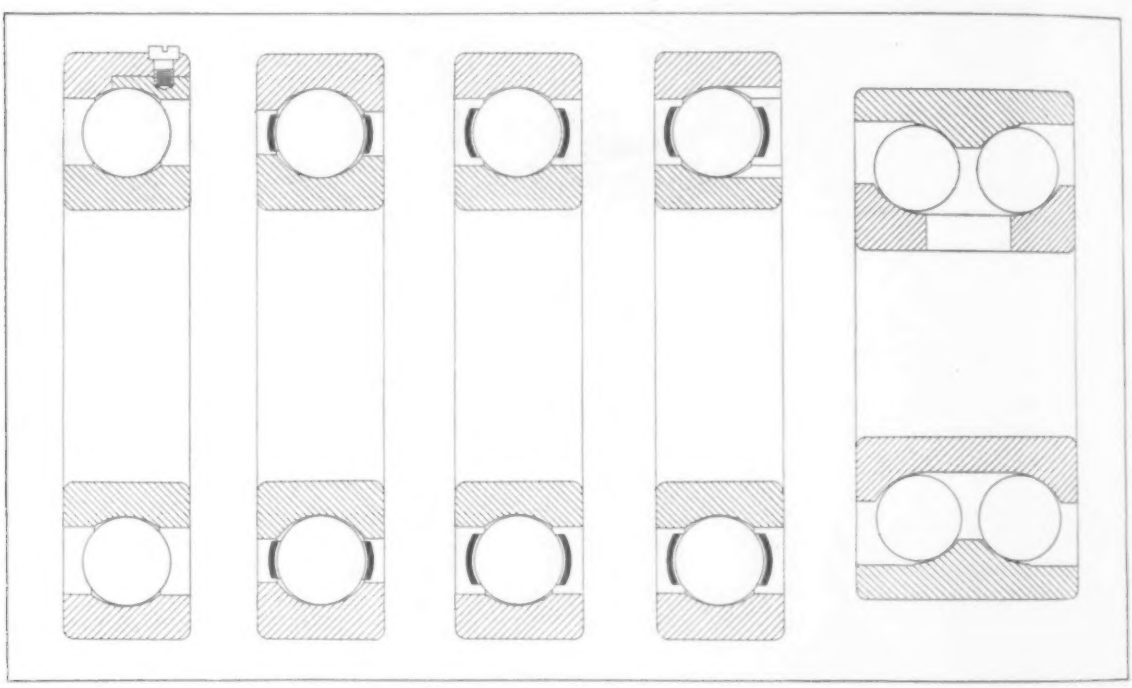
BY B. D. GRAY

About 1898 Professor Stribeck of the Technical Laboratories at Neubabelsberg, near Berlin, was commissioned by one of Germany's leading industrial establishments to make an investigation of sliding, roller and ball bearings. Having taken up the manufacture of balls and ball-bearings, this firm, the German Small Arms & Ammunition Works (the Deutsche Waffen und Munitionsfabriken, or DWF) of Berlin, very soon felt the imperative need for a scientific basis, if the manufacture were to be removed from the domain of haphazard, blind working, resulting one time in success and another time in failure. As a result, the following requirements, which form the basis of Hess-Bright ball bearing construction, were formulated.

1. Annular rather than cup-and-cone design for radial loads.
2. Use of alloy steels of much more than ordinary toughness and hardness.
3. Microscopic accuracy of size and form, down to a small fraction of a thousandth of an inch, in order that each ball may bear its share of load.
4. Uniform hardness from surface to center of both balls and races.
5. A mirror-like polish as a final touch to perfectly-ground surfaces.

Specialists can now manufacture balls that are true spheres to within 0.0001 in., at relatively small cost. This led to numerous attempts to employ a series of rows of balls instead of rollers, in none of which was proper provision made for taking care of the deflection of the shaft and box under load. After an endless number of expedients to provide for proper load distribution had been tried without success, the simple plan of using a single row of balls, and that of suitable proportion for the load, was adopted. This resulted in a journal having no appreciable length and accordingly free from trouble caused by deflection. Hess-Bright annular bearings will permit tilting the inner race, with respect to the outer race, approximately ⅛ in. to ¼ in. in 12 in., this being dependent upon ball size, groove radius and clearance between ball and grooves.

The problem was then to proportion the diameter and the number of balls to the load to be carried. As the number of balls in a single circle was necessarily limited and as the journal diameter could not be indefinitely increased, it became important to develop the carrying capacities as affected by the shape of the ball tracks and the nature of the materials. The necessary design data were found to exist in the observations and experiments conducted by Stribeck.



From Left to Right the Illustrations are: Fig. 1—Riebe's Design of Ball Bearing; Fig. 2—Conrad's Design, Monarch Type; Fig. 3—Conrad's Design, Regular Type; Fig. 4—Side Filling Opening Type; Fig. 5—Bright's 2RO Design

It was found that the frictional resistance was least for balls rolling between straight line sections, or perfectly flat surfaces, giving two points of contact. Increasing the points of contact to three or four produced higher frictional resistance without materially affecting the carrying capacity. Curving the race resulted in an important increase in carrying capacity, with a barely measurable increase in friction. This greater carrying capacity is accounted for by the fact that in a rolling bearing, in the absence of grit, there is no wear as in a sliding bearing, but a destruction by crushing of the surfaces in actual contact. This point in the race, when overloaded, is flaked out. If, in a ball bearing, the race is curved, the stressed particle cannot be flaked or pushed out, being confined and supported by the wedges of material on either side. The resistance to crushing is thus greatly increased by curving the race.

From his experiments, Stribeck developed the

*From a paper read before the Electric Vehicle Association of America, Philadelphia.

Photomicrographs of Ball Surfaces Magnified 120 Diameters

llowing equation for the carrying capacity of an nnular or radial bearing:

$$P = k\,d^2\,\frac{n}{5} \text{ in which}$$

= carrying capacity of bearing in pounds.
= ball diameter in eighths of an inch; e. g., for ½-in. diameter ball, $d = 4$.
= number of balls in bearing.
= constant dependent upon the material, the shape of the ball supporting surface, and the speed.

This is the commonly accepted equation for determining the carrying capacity of a radial bearing nd one much made use of by those exponents of the heory that the carrying capacity of a bearing is irectly proportional to the number of balls conained. Other things being equal, this would be rue, but it must be borne in mind that the race ross section plays a vital part also in determining he carrying capacity of a bearing. Any device hat may be employed for the insertion of a larger umber of balls than can be gotten into the bearing y eccentric displacement, such as filling slots, makng one side of the race groove shallow, etc., eakens the race and hence results in a decreased arrying capacity. A bearing with continuous ings, deep ball grooves, and as many balls as can e inserted without forcing, makes the best bearng. These stiff rings are susceptible of extreme ccuracy of manufacture, and maintained accuracy n service, even though mounted in slightly out of ound housings.

To assemble balls into a bearing having flat aces is simple enough, but when the race is curved ome provision must be made for inserting balls in xcess of those introduced by eccentric displaceent. The obvious thing is to cut a narrow cross hannel, known as a side filling opening. But as he carrying capacity of a ball bearing with unnterrupted race section is greatest, it follows that ny opening for the side filling of the balls, which ould break such section, would correspondingly ocally reduce the capacity. Such an opening would ave to be kept on the unloaded side of the bearing, r avoided altogether. Riebe's design, our first evelopment and the predecessor of the present nnular ball bearing, was of this kind. The balls ere introduced through a cut in one race at the ide, the continuity of the race being restored by filling in piece, as indicated in Fig. 1. Still the ut constituted a weak point, and a screwhead was tilized to keep this joint at the unloaded side.

To Conrad belongs the merit of eliminating the filling opening and providing an annular bearing of continuous race and uninterrupted groove, as shown in Figs. 2 and 3. Incidentally, also, all of the troubles due to interference between balls and filling opening edges were done away with. To assemble this bearing, now generally known as Hess-Bright, HB or DWF, the inner race is placed eccentrically with the outer, the balls are filled into the crescent-shaped space between, the races are centered, the balls are distributed and a cage is provided to maintain the proper distribution, to prevent the balls from rubbing against each other and incidentally forming a unitary device.

With bearings for carrying thrust, to secure the full carrying capacity, the two collars must be in practically absolute parallelism. A deviation of less than 0.0001 in. will concentrate the entire load on a few balls at one side, overload these and reduce the bearing capacity. To secure exact parallelism between the shoulders on a shaft and the housing seat, even under deflection and the small yet important and unavoidable errors of workmanship, one collar is generally given a spherical surface, as in Fig. 6, which surface permits it to adjust itself in the cupped seat and thus secure the parallelism required.

Radial bearings are capable of carrying considerable thrust load, amounting in the deep groove or Monarch type to about 25 per cent of their rated radial capacity.

Grinding or polishing marks that may be detected by the naked eye condemn balls and the ball tracks utterly. Oft-repeated endurance tests under conditions where the finish was the only variable, abundantly proved this, at first unsuspected, fact. The higher the finish, the better the endurance of the bearing. Photomicrographs of ball surfaces reveal that what appears to be an absolutely flawless surface is in reality composed of fine scratches, pittings and even gash-like defects.

The balls must represent as close an approach to true spheres as it is possible to realize. To secure the necessary even division of load, the balls in a bearing may not vary more than 0.0001 in. from one another and from truth of shape.

Bearings must be lubricated. The oft-repeated statement that ball bearings can be run without lubrication is pernicious.

Photomicrographs of Ball Surfaces Magnified 120 Diameters; No. 5, Surface of Hess-Bright Ball

Bearings must be kept free of grit, moisture and acid. This prohibits the use of lubricants that contain or develop free acids.

The inner race must be always clamped solidly to the shaft, so that no vibration can cause it to turn. This requires that the shaft be ground perfectly true, in order that it may make contact with the race all around, not merely at a few points. Unless this is done, a peening action will start, resulting in looseness. The race itself should be mounted with a light press fit, and very solidly clamped between a nut and shoulder.

The outer race must be mounted in such a manner as to permit slow creeping. This has two beneficial effects. First, it avoids any possibility of an undesired endwise cramping of the balls in the race; second, such minute wear as occurs in the ball path is distributed around the entire circumference of the latter. To accomplish these results the housing must be accurately bored to such a diameter that the outer race will be a sucking fit in it, and the race is either left entirely free endwise or is confined between shoulders which give it a slight endwise freedom amounting to 1/64 in. or less. Only one bearing on a shaft may be confined endwise in this manner, since otherwise expansion or errors in machining or workmanship would produce undesirable axial or endwise cramping.

In the ball bearing we have not a point contact as many suppose, but a substantial area due partly to deformation and partly to the shape of the parts in contact; I refer to the concavity of the ball path or grooves whose radius in one direction very nearly coincides with that of the ball.

This was very clearly brought out in a test which we made a short time ago: 1½-in. balls in contact with a flat disk, a grooved disk, and a cupped disk, as shown in Fig. 13, were subjected to a load of 10,000 lb. in our testing machine.

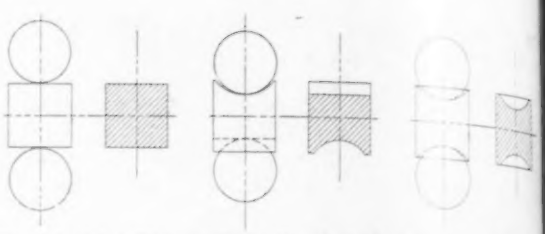


Fig. 13—Flat Disk at Left, Grooved Disk in the Middle and Cupped Disk at Right

Vitriol was applied around the contact points and allowed to etch the exposed surfaces, that is, those which were not actually in contact. Then the load was relieved and the contact diameter was measured by means of a micrometer microscope. In the cases of the flat and cupped disks, the areas of contact were circular, but in the case of the grooved disk, the area of contact was elongated, resembling an ellipse. The pressure per unit area was computed and found to be:

Flat surface	581,395 lb. per sq. in.
Grooved surface	212,766 lb. per sq. in.
Cupped surface	146,413 lb. per sq. in.

This test shows clearly the reason for the increased carrying capacity of the curved (grooved) ball track type of bearing as against that type with flat or practically flat tracks. It is self-evident that the more closely the groove envelops the ball, the lower will be the pressure per unit area and hence the greater will be the ability to carry load.

As an indication of the capacity and durability of ball bearings, I will give you the results of a test recently completed. A No. 6407 bearing was subjected to a radial load of 3500 lb., thrust load of 1750 lb. and run continuously at 1445 r.p.m. for 531¼ hr. before failure occurred. This bearing has a bore of 35 mm. (1.3780 in.); outside diameter of 100 mm. (3.9370 in.), and a width of 25 mm. (0.9843 in.).

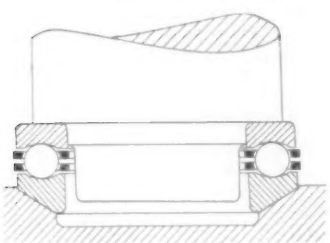


Fig. 6

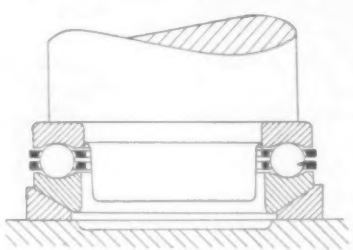


Fig. 7

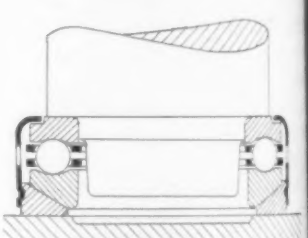


Fig. 8

THRUST TYPE BALL BEARINGS

Fig. 6—Thrust Bearing with Spherical Seat. Fig. 7—Bearing with Aligning Washer. Fig. 8—Bearing with Aligning Washer and Enclosing Case. Fig. 9—Two-Direction Thrust Bearing with Spherical Seats. Fig. 10—Two-Direction Thrust Bearing with Aligning Washers. Fig. 11—Flat Type of Thrust Bearing. Fig. 12—Flat Type of Two-Direction Thrust Bearing.

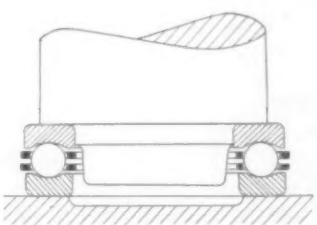


Fig. 11

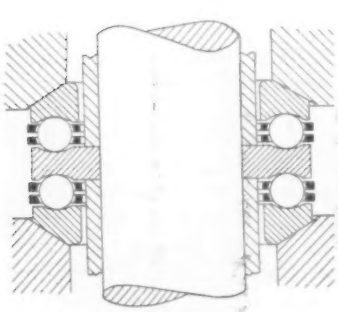


Fig. 9

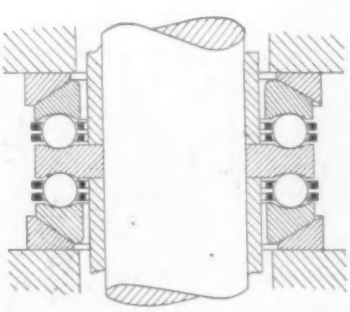


Fig. 10

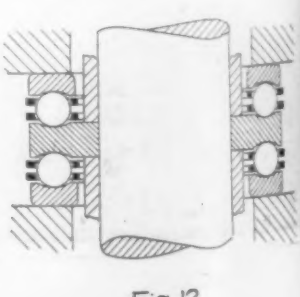


Fig. 12

e Safety Features at the Union Iron Works, San Francisco

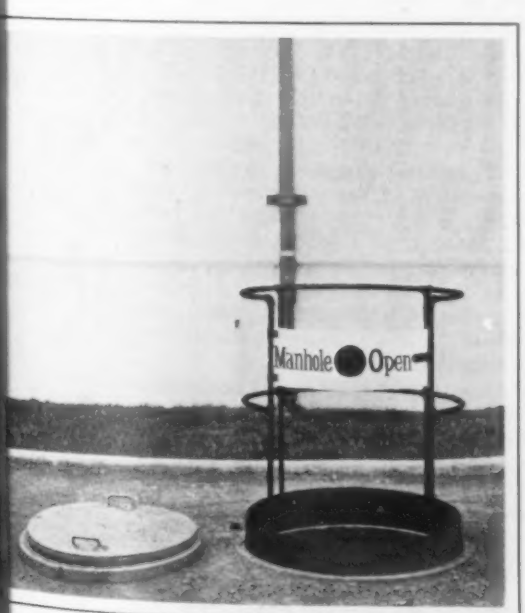
The accompanying illustrations show two features of safety work provided at the plant of the ion Iron Works Company, San Francisco. Considerable attention has been paid to general safe-

vas Protected Entrance to the Hospital Room of the Union Iron Works

arding, both in and out of the buildings, but the asures follow generally accepted practice and ploy devices already well known.

One of the pictures shows pretty clearly the eme for guarding an open manhole. In addition the pipe railing, the opening in the railing is vided with a hinged sign bearing the large red cle closely identified with the safety first movent and especially well calculated to arrest attenn.

The other of the pictures shows the attractive trance to the works' hospital. A length of canvas stretched over the gravel yard outside the hosal room and serves not only to keep out dirt and all pieces of gravel, but prevents slipping and



of the Open Manhole Guards in Use at the Plant of the Union Iron Works

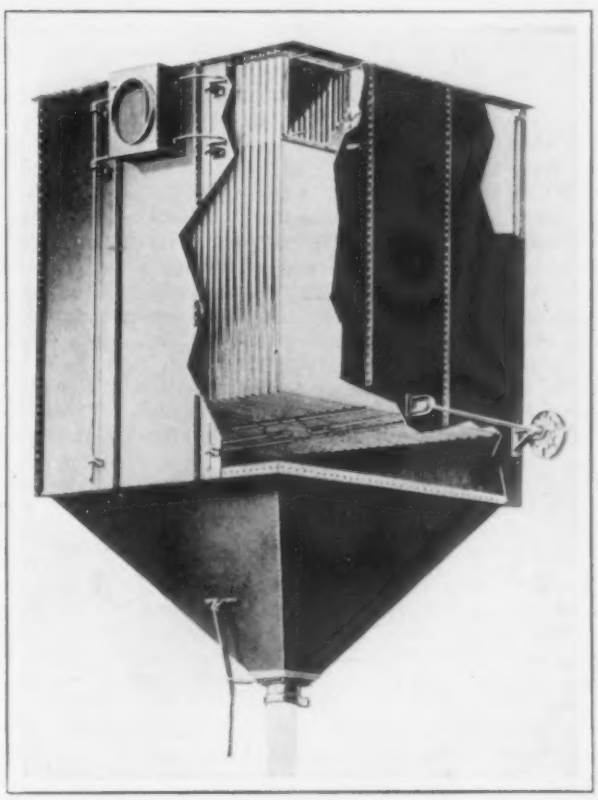
has a favorable influence on the effort to keep the hospital in the highest state of cleanliness.

The works are notable for tidy yards and the fact that the special consideration given by the management to surroundings has a good effect is indicated conspicuously in one case where an employee has provided a double line of flowering plants in tubs, flanking a broad outside stairway to one part of the paint shop.

Dust Arrester Employing Cloth Screens

For collecting the dust from tumbling mills, emery wheels, sand blast equipment, etc., the Whiting Foundry Equipment Company, Harvey, Ill., has recently brought out a cloth-screen dust arrester. The device consists of an outside case or housing made of heavy sheet metal in which a series of cloth screens are located. These screens are relied upon to take out the dust from the air and to permit the free passage of the air.

The screens are of cloth tacked and glued to each side of the framework and the dust laden air strikes the outer surface of the cloth on each screen. These



A Dust Arrester with Cloth Screens for Collecting the Dust from Tumbling Mills, Sand Blast Equipment, etc.

screens are hung from a set of angle irons which are bolted to the inside of the housing. The air is drawn through the filter, the pipe from the fan being attached to the collar shown at the left of the engraving.

For cleaning the screens of the dust that has been extracted from the air, a pulley on the outside of the housing at the right drives a jarring mechanism. This jarring rod agitates a series of stationary hammer bars on the under side of the screens and transmits the motion causing the latter to vibrate and thus release the dust. The starting and stopping of the jarring mechanism is controlled by a jaw clutch located adjacent to the pulley. The dust collects in the bottom of the arrester in the inverted pyramidal portion and is removed through the canvas spout at the bottom when the valve at the top is opened.

Pattern Storage Systems for Factories

Good Records and Competent Help Factors Necessary to Success—Marking Systems to Be Designed to Meet Local Conditions

BY JOHN G. SHIRLEY

In the modern factory engaged in the metal trades, there is no department where there is more variance in method and policy than in the pattern loft. In any plant, large or small, the proper storing of patterns is a very important problem, and a proper task for an intelligent, conscientious man. This important work is done, in a great many factories, in a haphazard and perfunctory manner by incapable, and not infrequently, shiftless men.

MANAGEMENT

The most common and best control of a pattern storage is secured by giving the foreman patternmaker full charge, with an assistant foreman or storage clerk, directly responsible to him. In plants which do not have pattern shops, or where the foundry superintendent has charge of the pattern storage, the storage clerk should be directly responsible to him. The manufacturing orders should pass through the office of the man in charge to facilitate checking them up with the pattern inventory, drawings, or other statistical matter that should properly be located in his office, such as interchangeability of parts, capacity of foundry per day for each part, etc.

In a large loft a storage clerk of such caliber that he can check up the patterns to the blueprints is desirable. In a small loft, and invariably in the case of new work, the foreman patternmaker should measure and check up all patterns and coreboxes. A most effective method to insure accurate checking up of work, is to back charge to the department all labor and material expense incurred up to the point where the error of the pattern department is discovered. These returned or back charges are generally added to the overhead of the pattern department.

In addition to checking up patterns, the storage clerk should decide what repairs are to be made, and keep all records and card indexes in a tidy, legible manner. His helpers should be more than ordinary truckers, with good memories, and capable of locating and storing patterns quickly and properly. A good helper is a jack of all trades who can handle such odds and ends as replacing fillets and letters, shellacing or even making minor repairs or changes to patterns.

The work in most industrial establishments comes under one of three classes: standard, special and miscellaneous. Standard line patterns are not altered to any considerable extent, unless it is to be a permanent change. It is convenient, therefore, to carry an extra set of patterns, on which changes from the standard lines of a popular variety may readily be made for special or modified orders.

When a new or foreign pattern is received in the loft for the first time, it should be assigned a location and this fact noted in a card index or pattern list. In order that it may be identified it must be marked, as nobody can remember the name and use of each pattern and its parts, although some men pretend that they can. It is necessary to mark and record patterns to distinguish them from one another, to identify the castings, prevent loss, aid in the keeping of an inventory so that patterns will not become listed as, "use unknown," and serve as a key to the location of the patterns on the racks and shelves.

Most patterns are large enough so that raised letters and numbers are the most satisfactory. On small castings recessed characters are often desirable, and a machine which works on the pantograph principle does this work very neatly. The cut-in characters are hard to eradicate in case of a change in the symbol. Raised characters lend themselves readily to artistic arrangement but are very apt to get knocked off. Raised characters on a metal strip, as stamped out on a vending machine, are very satisfactory and speedy, although letters can only be arranged in a straight line. Loose pieces or parts of patterns should be marked not only with the number of the pattern of which they form a part, but also with a symbol stamped on both the loose part face and the pattern surface. This facilitates the identification of a lost piece and also aids the molder in getting the loose part located on the pattern correctly.

In plants numbering their patterns consecutively as they are made, it is customary to assign patterns to the shelves in order of completion excepting for large patterns and molding machine plates, which are placed in different and more accessible sections. When racks and locations are arranged according to classes of work, new patterns are assigned to their location accordingly. Patterns should be inspected as they are returned from the foundry, to determine whether repairs are necessary, and to see that all loose parts and coreboxes have been returned. Loose pieces should be tied up in bundles or tacked on the pattern with wire brads.

A system that proves to be the smoothest running, most accurate and successful in one plant might be a utter failure and deficient in almost every requirement if used without change in another plant. Each storage is a problem in itself and must work out its own solution, the system best suited to its own requirements. To be successful a system must be accurate and yet flexible, while ease of finding and accessibility are dependent on the arrangement and type of storage building.

PATTERN MARKING SYSTEMS

The mnemonic system has been applied very successfully to some lines of work, and especially so in shops under the Taylor system of scientific management. In pattern storage the simon-pure mnemonic system hardly exists, because the symbols are generally rather long and not well adapted for use on small patterns. On large patterns it is very effective, because it is so suggestive and definite.

A mnemonic symbol is a group of letters and figures (mainly the former), arranged in order of significance so that a suggestive and definite comparison with the full name of the article symbolized is pictured to assist the memory. AT12F is a very simple example and much shorter than most mnemonic symbols.

The vowel system is not a vowel system at all and next to useless for practical application to even a small variety plant. Because the vowels I and O are so much like the figures 1 and 0, R is substituted for the vowel I and K for O. A pattern for a 12-inch shaft coupling would be represented by the symbol 12AK3 assuming that this was the third pattern made in this class. A represents shaft because it is the first vowel after the first letter in the word shaft. K for coupling because C has been substituted for O in the list of vowels.

A factor which affects the permanency of the vowel system vitally, as well as several other systems, is the different people call the same article by different names. Take an ordinary gate valve, for example: "plug," "gate" and "wedge" are all names applied to the same part, while "cap" and "bonnet" are identical, and "spindle" and "stem" refer to the same part.

It is hard to find two systems even nearly alike in practice, because the systems in use, and the various combinations brought about by changes in management and circumstances, generally represent a gradual evolu-

from no system whatever. A system which uses a decimal point or a dash to separate its elements, especially if it is composed entirely of figures is not satisfactory. These small dashes and dots are very difficult to place on a pattern and still more difficult to make stay there, even with unusually careful handling. A great many systems are the personification of the folly of some man. Oftentimes they are very efficient and fitting monuments to the men in whose brains they evolved. More often they prove in final analysis to be entirely devoid of all system. The most efficient and satisfactory systems are based on a classification of the finished product.

A very flexible and accurate system using figures can be best explained by assuming an example, say a stove foundry. The manufactured product would probably be best divided into four general classes, and symbols applied as follows:

R—Ranges and cook stoves.

H—Parlor stoves and various heaters.

F—Furnaces, hot air, steam and hot water.

M—Miscellaneous or casual patterns used for shop fittings, outside work, new machines, jigs, fixtures, etc.

These general classes could be still further subdivided. Take the F, or furnace class, for example. FA—Hot air furnace parts. FW—Hot water furnace parts. FS—Steam furnace parts.

Different furnaces might vary in the diameter or length of the grate. 24FA5 might be the symbol for the ash pit door of the hot air furnace having a grate 24 in. in diameter. After the pattern class symbol or directly after the last letter can be placed the pattern number which is assigned for each separate pattern.

In any class of work where the size element is a governing factor, and the work can be readily divided into no less than a couple of dozen classes, the letters I and O being discarded, this general type of system is very efficient and meets all requirements.

When more than twenty-four classes of product are manufactured, a system made up entirely of numbers is the simplest. The first two figures of each symbol representing the class to which the pattern belongs and the remaining figures constitute the pattern number. Symbols of this character might take the form of the following examples—513, 019, 29,315, 0516, 1967, in all of which the first two figures represent the class and the remaining figures are pattern numbers.

For a jobbing shop which owns its own patterns and very seldom builds the same thing twice, such as a shipbuilding concern, a specialty machine or engine works, etc., a different problem exists. It is next to impossible to divide the product into standard classes, so there is no simpler or more efficient way to keep track of patterns, than to number them consecutively as they are completed, with a new series for each year.

Again nothing but figures are used. The first two figures represent the year the pattern was made and the remaining figures the pattern number. Thus pattern No. 154 was the fourth pattern made in 1915 and 309 was the 309th pattern completed in 1902. At first this system only shows the year the pattern was completed and does not furnish any key as to what the pattern was built for, unless reference is made to the inventory on the books or card index.

All systems are more or less interrelated, and several combinations of the systems set forth in a brief way in this paper are to be found in the different lofts scattered over this country.

Pattern storage clerks often think that the simplest system would be to number the patterns according to the drawing numbers. The most important reasons why this cannot be done are: Drawings multiply faster than patterns and every drawing does not necessitate a pattern. Many patterns such as are made for frame plates, gates, broken machine parts, etc., are made without a drawing.

Invariably no matter what the system may be, or in whose fertile brain it may have originated, the pattern number should appear on the blueprint. The number is of great assistance throughout the plant and especially so in the pattern department. Notes on new drawings showing old pattern numbers that can be used, even if a slight change is made, are desirable.

In every progressive plant a certain proportion of the patterns necessarily become obsolete. It is desirable to remove them to a separate storage or out of the way section of the live storage. Casual or makeshift patterns such as the millwright occasionally has his carpenter make, or the tool department causes to be made, generally find a resting place there. Some plants destroy such patterns immediately after the casting has been machined.

When the storage becomes crowded and no other room is available, a committee made up of the works manager, sales manager and foreman patternmaker or foundry superintendent should determine which obsolete patterns are to be destroyed. This is a very important phase of pattern storage. Because of the uncertainty of future demands, the function of designating which patterns are to help fire the cupola is usually dodged by most of the officers of the company.

STORAGE PRACTICE

Sweeps are treated like patterns, although in this country the majority of these skeletons naturally graviate to the obsolete pattern storage. In Europe, especially in the large shipbuilding yards, sweeps form a goodly proportion of the live patterns.

Molding machine patterns are multiplying very rapidly and can be stored best in racks, preferably of the angle iron type. They should not be stored or transported piled one on top of the other, as breakage and bad alignment of patterns result.

A special truck consisting of a small section of storage rack mounted on large swivel casters gives very satisfactory results in transporting machine plates. Stripping plates are stored with the machine patterns, and where a single stripping plate is used for several patterns, it should be stored with the one it is used with the most, and this fact noted on the card index for all patterns affected.

Coreboxes stored with their respective patterns give the best satisfaction except for machine patterns. Such boxes can be stored separately most efficiently and likewise for boxes used with several patterns. In such cases the proper cross references should be made on the storage list for all patterns affected.

COLOR SCHEMES

An item of considerable importance in an establishment making several kinds of castings is, how to make the pattern show of what the casting is to be made, and what shrinkage has been allowed. This is best accomplished by using a system of different colors, for shellacing the patterns.

A very satisfactory color scheme is suggested as follows: Red, for all coreprints and faces where loose parts are attached; black, for cast iron; olive, for steel, and yellow, for brass, bronze and alloys. Where this last class of work is very extensive still further divisions are made, as orange for bronze and mixtures of a better grade than brass and blue for alloys, monel metal, aluminum, etc. Blue is also used for malleable iron in plants which have extensive iron and steel work.

Where patterns are being shipped out to foundries, more than ordinary care must be exercised in checking and keeping track of them because of the increased chance of loss and mistakes.

INVENTORY

No matter what system is used in a pattern storage loft, an up-to-date inventory properly linked with the use and location of each pattern is necessary. The actual labor required to keep an accurate continuous inventory in a pattern storage loft is nowhere near so great as is the case in a stores or stock room. It may be kept either in a set of books or on a card index. If unnecessary data are withheld from it, a few minutes spent on it each day will keep the system right up to the minute and greatly increase its working efficiency.

It must be simple of operation, because it is desirable to keep three copies; one in the engineering department, to facilitate numbering the parts on the drawings and prevent expensive duplication; one copy brought up to date occasionally and kept in the vault for protection against fire, and the working copy kept

in the pattern loft, to identify, locate and return patterns to their places correctly. An inventory should therefore properly record the following data: Name of part, kind of pattern, description, number, use, location, number of loose pieces, coreboxes, date made, drawing number, changes with dates, weight of first casting, capacity of foundry per day, losses, returns (if they are found) and destruction. These facts vary in importance with different plants and many are omitted in some plants, but the record of each pattern in the loft should be kept right up to date. Cross references are of great assistance and facilitate speed in the use of the inventory.

Two sets of card indexes are often desirable, especially in a numerical system; one arranged numerically and the other according to classes or subjects. A numerical index facilitates relocating patterns and need only contain the number, name and location data; such as aisles, rack, and shelf number. Other information if needed can be obtained from the subject inventory.

Several storage systems have been described in this paper. Desirable features under all conditions are insurance of the continuous and economical operation, flexibility of system, accessibility and certainty of having the proper pattern at the right time.

COMBINATIONS FOR EXPORTS

Amendment of Sherman Act Grows Upon the Trade Commission

WASHINGTON, D. C., Aug. 2.—The Federal Trade Commission has decided to send a representative abroad to study the European cartels and other semi-official combinations of producers and dealers. This is accepted here as notice that the commission will not be ready when Congress meets to make its report as to the necessity and propriety of amending the anti-trust laws so as to permit combinations of American manufacturers and exporters for the development of foreign trade. In the present unsettled condition of the principal European countries the commission's representative will encounter considerable difficulty in prosecuting his task, and it is hardly to be expected that he can complete his work within less than two or three months. The commission's own investigations in this country in connection with the export problem are expanding in several directions and the material for the projected report, it is estimated, cannot be collected and arranged for examination much before Jan. 1. The actual drafting of the report will occupy several weeks, and it is therefore improbable that President Wilson will have before him any recommendations of the commission concerning export combinations when he prepares his annual message to Congress in November.

Reports from the commission, which is now making a six weeks' tour of Western States for the purpose of conferring with business men of all classes, indicate that much valuable information bearing upon the export problem has been gathered, and the impression is crystallizing among officials of the commission that the situation calls for the drafting of an amendment to the Sherman law that will specifically exempt export combinations from its provisions, placing them in a class by themselves, licensed to do most of the things which the anti-trust act forbids in domestic commerce. The proposed amendment, however, must be safeguarded on two points. First, combinations for export trade must be so limited in their organization and activities that they cannot be utilized, either directly or indirectly, for the restraint of domestic trade, and second, participation therein must be so unrestricted that all manufacturers and dealers in the same line of business may avail themselves of their opportunities. The latter requirement is one which President Wilson has repeatedly impressed upon the members of the commission, and he has publicly declared that he will give his support to no project which does not guarantee that export combinations shall be free to all that desire to enter them.

Numerous misleading reports have been publi with regard to a decision which the Federal T Commission is alleged to have made to the effect t an individual withdrawing from a corporation co compel the corporation to abandon the use of his na in its title. In view of the widespread interest arou in this matter the commission, contrary to its us practice, has made public the facts in the case. T complainant, J. Lee Whitmore, a minority stockhol in the Berry & Whitmore Company, Washing D. C., was employed by the corporation as treasur Subsequently Whitmore had a disagreement with t dominating stockholders, sold his stock to Berry a insisted that his name be withdrawn from the co porate title, which he alleges Berry agreed should done, but afterward refused or failed to do. Subs quently Whitmore organized a corporation under t title of the Whitmore, Lynn & Alden Company, a engaged in the same line of business as was carri on by the Berry & Whitmore Company. The commi sion was requested in the complaint to take jurisd tion of the matter for the purpose of issuing an ord requiring the Berry & Whitmore Company to wi draw the name of Whitmore from its corporate ti In dismissing this complaint the commission says t if there was any violation of law presented in t case it was not of anti-trust acts nor of the feder trade law. The controversy is regarded as mere a dispute between a vendor and vendee of stock, which the commission could not take jurisdiction.

W. L. C.

World's Production of Petroleum in 1914

The quantity of petroleum entering the markets the world in 1914 amounted to 400,483,489 bbls., 42 gal., according to statistics compiled under the supe vision of J. D. Northrop of the United States Geolo cal Survey. Of this record-breaking output the Unit States is credited with 66.36 per cent, representing quantity a trifle less than double the output of all t other oil-producing countries combined. The followi table shows the marketed production of petroleum the world in 1914, and for purposes of comparison t corresponding output in 1913 in barrels of 42 gal.:

	1914,	1913,	Total, 1857-1914	
Country	Production	Production	Production	Per cent
United States..	265,762,535	248,446,230	3,335,457,140	58.6
Russia	67,020,522	62,834,356	1,622,233,845	28.5
Mexico	21,188,427	25,902,439	90,359,869	1.6
Roumania	12,826,579	13,554,768	117,982,474	2.1
Dutch East Indies	12,705,208	11,966,857	138,278,392	2.4
India	8,000,000*	7,930,149	73,979,919	1.3
Galicia	5,033,350*	7,818,130	131,873,601	2.3
Japan	2,738,378	1,942,009	27,051,158	.4
Peru	1,917,802	2,133,261	14,306,972	.2
Germany	995,764*	995,764*	12,965,569	.2
Egypt	777,038	94,635	1,086,728	.0
Trinidad	643,533	503,616	2,069,430	.0
Canada	214,805	228,080	23,492,610	.4
Italy	39,548	47,256	802,229	.0
Other countries	620,000	270,000	1,322,000	.0
Total	400,483,489	384,667,550	5,593,262,936	100.0

*Estimated.

A Scarcity of Chromium

The supplies of chromium are limited and a scarci is not improbable. The ores come ordinarily, says th *Engineering and Mining Journal*, from New Caledon Turkey and Rhodesia. Turkish commerce is stopp and the other two sources of supply are probably co mandeered for France and Great Britain. Only o mine is operating in this country and two more mig be. Some of the brick makers are understood to hav notified their customers that they can supply chrom brick for only a little while longer, some shapes bei now unobtainable. Chromium exploration and develo ment is urged as profitable.

The imports of manganese ore into France in 191 were 153,449 metric tons as compared with 258,9 tons in 1913. The ferromanganese imports were onl 4970 tons compared with 14,394 tons in 1913. The im ports of iron ore were also much less in 1914 than i 1913, being 698,319 tons and 1,410,424 tons respectively

leter for ecording Flow Over Weirs

A recordi meter that can be used with weirs the V-notch or rectangular types or submerged rifices has been developed by the Harrison Safety oiler Works, North Philadelphia Station, Philaelphia, Pa. This device is regularly furnished

Recording Meter for Use in Connection with Flow Meters and Metering Boiler Feed Water Heaters

n connection with the maker's V-notch meters nd metering heaters, and employs a multiplying echanism, integrating attachment and a visible ointer, the last enabling the rate of flow to be ead from a distance.

The mechanism employed to translate the moion of the float and cause the recording pen to ove properly is, as is usually the case, a cam. n this device the cam is laid out as a spiral on flat circular plate and the multiplying mechansm consists of a small drum mounted on the pindle of the cam and having a thin metal cable rapped around it. This cable is attached to the loat spindle and is kept taut by a counterweight n a second cable. The spiral groove is cut into he surface of the disk and is arranged so that the part of the cam corresponding to low heads is near he center, while that corresponding to the high eads is near the periphery. A single cam serves ll weirs having the same law connecting head and low and to accommodate the recorder for use with weirs of different types it is emphasized that he only change necessary is to substitute cable drums of the proper diameters. The use of this able drum instead of the gear and pinion drive ormerly employed is relied upon to eliminate ack lash, while the cam spindle has been mounted pon anti-friction rollers with a view to reducng the friction as far as possible.

The carriage pen has large rollers or wheels hich rest upon horizontal ways, so that the cam ollower which is attached to the pen carriage oves diametrically to the cam disk, this construction being relied upon to prevent the cam follower from being accidentally displaced from the cam slot. The pen rests against the chart drum by gravity and can be removed for cleaning of the pen or while the chart is being renewed. The direction of motion of the chart drum is such that the progress of the pen is from left to right when the chart is held with the bottom toward the observer.

The chart is driven at a uniform rate by clockwork and the pen thus records the rate of flow at each instant and the area under the pen trace is proportional to the total flow for any elapsed period. This arrangement enables the total amount of water which has been fed to boilers, for example, to be obtained by the use of an ordinary engine planimeter, and by comparing this quantity with the amount of coal used, the total and average evaporation for the day can be determined.

To enable the total flow to be obtained directly, an integrating attachment has been added. This consists of a counting train suspended from the pen carriage and driven by a small aluminum roller which rests upon an aluminum clock-driven disk. This roller is at the center of the disk when the float and cam are at the position corresponding to the zero head and thus no motion is received by the roller from the rotation of the disk. As the pen carriage travels away from the zero position, the small roller is carried the same distance from the center of the disk and is propelled at a rate corresponding to the rate of flow over the weir. The total movement of the counting train will therefore correspond to the total flow. With a view to enabling the rate of flow to be read from a distance, a visible pointer moving along a large scale with open divisions has been added.

A single clock is used to drive the chart drum and integrator disk, both of which are attached directly to the spindles of the clock train. The heavy propelling weight is suspended by a cable which winds over a drum, the spindle of which also carries the chart drum. This spindle is connected by a flexible coupling to the first shaft of the clock movement. The clock spindle which revolves with the weight drum carries at its other end a gear meshing with a pinion on the spindle of the integrator disk, which is on the same level with the chart drum. The gear on the spindle of this disk drives an intermediate pinion on the spindle of a gear which drives the escapement, giving altogether only three gear reductions from driving weight to pendulum. As the pendulum is pivoted to swing in both directions, it can also be used as a plumb-bob to line up the case. The clock and the recorder parts are supported from brackets on a cast-iron base which is attached to the backplate of the case. The door is flanged and has felt gaskets around it and on both sides of the window to prevent the entrance of dust.

A light piston for internal combustion engines in general and especially for use in automobile engines has been brought out by the Walker M. Levett Company, Tenth Avenue and Thirty-sixth Street, New York City. The pistons are made from Magnalite, which is especially adapted Magnalium metal. Three of these new pistons weigh approximately the same as one of cast iron of similar design and proportions, and other advantages claimed for the metal are high thermal conductivity with a cooler running engine and a lighter inertia load.

Records for the Purchasing Department

Necessity for Correct Data to Guard Against Shortage of Material — Form for Recording Purchases—Anticipating Requirements

BY H. A. RUSSELL

The factory or mill whose purchasing department can be classed as really efficient, is in a much stronger position not only to obtain the required quality and minimum price, but also to secure the material when needed. And by "when needed" is not meant to imply a heavy stock for possible orders or a large number of expensive express shipments for which considerable money has already been spent in telegraph and long-distance 'phone charges. There is a medium course which can be controlled only by proper and correct records, not only as regards the actual needs of the manufactured lines, but also by the knowledge of where the material can be obtained and when shipment should be expected. There are three periods when shipments may be held up. First, when the mills and factories are exceptionally busy and the total of their incoming orders is greater than their maximum output. Second, when they are running on only part time and with reduced working forces. Third, when there is a shortage of the raw materials, or skilled labor.

If proper preparation has been made, any one of these three danger points may be avoided to a great extent. When the material desired is a universal product and can therefore be obtained from a large number of sources, the required quantity can in normal times be obtained readily. But even the output of these products may be curtailed by any one of the three causes mentioned. To be ready for any eventuality the purchasing department should have absolutely reliable data on a number of points which are enumerated in the following six paragraphs:

A list of all makers of the particular items needed for the regular manufactured lines. This list should be complete and up-to-the-minute, new names being added as rapidly as obtained and those firms who have discontinued the manufacture of that particular line eliminated.

A general knowledge of the conditions existing at the various factories or mills in which the item is manufactured, and which will affect the output of that item. This general knowledge can be best obtained by taking mental notes from trade papers, by conversation with salesmen and by correspondence.

Where an item is at all special there should be a list of possible substitutes for the article ordinarily used. This list should show a comparison between the regular article and the possible substitute and indicate the difference in weight or quality and approximate variation in cost.

By consolidating purchases of any one article with some other manufacturer using it the quantity can be made large enough to induce the maker to give the order prompt attention. When the mills are busy and the rollings are scheduled weeks and sometimes months ahead, a tonnage which in normal times would bring prompt rolling and shipment, is not sufficiently attractive to cause a change in the schedule.

A card index record should be kept of the quantities used each year or season. The method of recording steel bars, or slabs, or structural material or special shapes, can be best understood by referring to the 5 x 8-in. card shown. This card not only indicates the sizes, but also the different

1½" x ⅜" A Soft Steel. B Dead Soft Steel or Iron. C Hard Steel. D Plow Steel. E Spring Steel. F Cold Rolled Steel.

	GRADE		GRADE		GRADE
Saw Mill Brace	A	Star Plow Coulter Plate	A		
14-24 Tooth Harrow	A	#00 Coulter	C		
#42 Plows Coulter	C	#1 Landside	D		
Gang " Brace	A				
" " Landside	C				
#85 " Yoke	A				

YEAR	A	B	C	D	E	F	YEAR	A	B	C	D	E	F
1905	5 Ton	1 Ton	3 Ton										
1906	8 "	1 "	1 "										
1907	4 "	5 "	7 "										
1908	12 "	2 "	5 "										
1909	7 "	2 "	3 "										
1910	12 "	4 "	4 "										
1911	9 "	6 "	2 "	2 Ton									
1912	18 "	1 "	1 "										
1913	11 "	4 "	2 "										
1914	14 "	3 "	2 "	3 "									

Card for Recording Purchases of Various Grades of Material of a Certain Size

grades of the same size. This information is often of value in an emergency. It may be possible to substitute one grade for another. For instance, 0.30 to 0.40 per cent carbon steel can be substituted for soft steel, but this will very seldom work out the other way. These cards afford a quick comparison of sizes, which is also of value in an emergency or where it is desirable to use up odds and ends or sizes which have been superseded by other sizes or grades. With this card as a guide other cards can be easily planned to record numerous other purchased lines.

Satisfactory service on the part of the seller should be insisted upon. The purchasing department must know whether the promise of the shipper can be depended upon. At times it is necessary to send a representative to the mill or factory to make sure that the material is shipped in time. Ordinarily, however, these matters can be handled by mail, wire or telephone. The greatest service the purchasing department can do for the plant it is a part of is to anticipate as far as possible the needs of that plant. If you impress the fact upon the seller that ordinarily your orders are placed far enough in advance of your requirements so that a reasonable period may elapse between the receipt of your orders and the date of shipment, you will find that an order calling for rush shipment will receive the attention it merits, whereas if a large proportion of your orders call for quick shipment, you will find that the words "Rush" and "Urgent" lose their effectiveness and that you are having a hard task to secure the materials you really require.

The best method of anticipating requirements is by daily consultation with the sales department, by reference to the records of the quantities sold during the previous corresponding seasons and by having a knowledge of how the work ordinarily progresses through the different departments of the factory. Certain departments may require their share of the materials weeks or even months ahead of the other departments. This information can always be obtained through consultation with the various department heads or through the production department.

As the purchasing department is usually held responsible for any shortage of materials, it should be familiar with the stock on hand and should at all times be consulted regarding the stocks to be carried on hand. The reasons for this are many, but principally because this department is the only one that knows the length of time necessarily required to secure the materials at the least expense. Also the quantity to be purchased will often regulate the price to be paid.

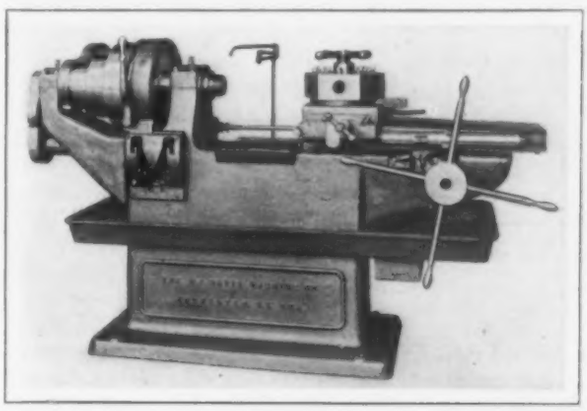
The keener the grasp on the needs of the factory or mill, the greater is the value of this department. When stocks are allowed to fall below the daily requirements of the factory or mill, the result is a loss in one or more departments, not only of time but also financially. When the production orders can go through the plant, without a hitch, the finished cost will always be less than when this or that department falls behind and possibly by so doing offsets the saving made in the other departments on that particular order.

The Tacoma smelter, Tacoma, Wash., has received from Cordova, Alaska, the past week three shipments of copper totaling in value more than $1,000,000. The American Smelting & Refining Company, which owns the smelter, is preparing to rush work on improvements planned to handle the enormous shipments which will continue to pour in from Alaska the next two months. One mine alone had an output for July of 3,000,000 lb.

A Redesigned 24-In. Turret Lathe

A modified design of 24-in. turret lathe has been brought out by the W. P. Davis Machine Company, Rochester, N. Y. Two types are built, one a plain machine and the other, which is intended for boring, forming and chucking operations, is provided with power cross feed to the turret. Another feature of the machine is the casting of the head stock and the bed in a single piece and the building in of the driving pulley with the headstock.

The driving pulley is of the large-diameter cone type with wide faces for the steps, and runs freely on the spindle, a friction clutch operated by a lever bringing it into contact with the spindle when it



A Redesigned 24-In. Turret Lathe for Boring, Chucking and Forming Operations That Is Also Built in a Plain Style

is desired to start the machine. This pulley is built into the headstock, which is cast in a single piece with the bed, an arrangement which is relied upon to give rigidity and strength. A positive jaw clutch which is built into the face controls the engagement of the back gears and in this way eliminates the possibility of belt slippage under heavy cuts.

The spindle is of heavy crucible steel and has a hole 2⅛ in. in diameter running through it, which enables a draw-in chuck and collet to be used. The spindle nose is bored to receive a center having a No. 6 Morse standard taper and the diameter of the threaded portion is 3⅞ in., the pitch of the thread being 3.

Feed changes, six in number, ranging from 0.008 to 0.100 in. per revolution of the spindle, are provided by a quick change gear box located directly under the headstock. The turret is of hexagonal design and measures 12 in. from face to face. The power cross feed on the machine illustrated is secured by roller chain and sprocket with adjustable automatic stop. Independent stops are provided on the saddle for each turret face to enable the shoulder work to be done. The power feed of the saddle is 21½ in., while the hand feed is 30 in.

The regular equipment furnished with the lathe includes an oil pan for the bed, a pump and the automatic stops for the turret. If desired, a cut-off rest with power or hand cross feed can be supplied.

Great Britain's imports of Swedish hematite pig iron were only 6618 gross tons in the first half of 1915, compared with 21,310 tons in the same period in 1914, while of forge and foundry iron the 1915 tonnage was 35,522 against 15,660 in 1914. Imports of Swedish bars were less than half the normal amount to July 1, 1915.

Commercial Production of Sound Steel*

Results with Sinkheads Applied to the Large-End-Down Gathmann Ingot Mold—Theoretically the Large-End-Up Mold Is the Best Practice

BY EMIL GATHMANN

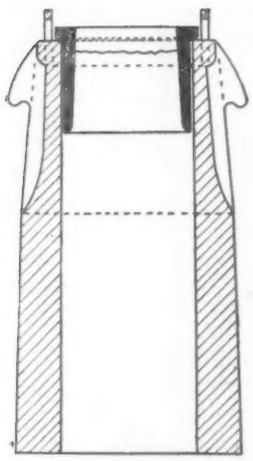


Fig. 1—The Gathmann Design of Ingot Mold With Sinkhead and Large End Down

THROUGH wide experience at numerous mills in the United States I have found that there is a decided difference of opinion among the producers of steel as to what constitutes commercially sound steel. Some metallurgists insist upon having, for certain grades of steel, a so-called "open steel," *i.e.*, one which contains numerous blowholes of varying sizes, and consequently but little volume of true pipe, although a central intermittent shrinkage cavity often extends well down into the ingot. Such blowholes and pipe are extended to weld up during rolling or forging, because their surfaces are not oxidized. Even if this be admitted, included slag particles and a high degree of segregation are bound to be present in the product of such ingots.

Blowholes are the result of an oxidized heat, and all heats, unless made or finished in the electric furnace, are oxidized more or less. Subsequent deoxidation, or rather degasification, either in the ladle or in the mold, or in both, is necessary to reduce or prevent blowholes. As is well known, a greater yield of billets or sheets is secured from the ingot by allowing the formation of blowholes, but this is undoubtedly obtained at the expense of the quality of the product. Decided segregation of carbon, phosphorus, and sulphur, as well as small included slag particles, undoubtedly exists throughout the greater portion of all so-called open steel, and cannot be removed by cropping.

The first requisite for sound, homogeneous steel ingots and blooms is therefore, in my opinion, so to treat the steel in the furnace, ladle and mold that "piping" steel is produced. The line of demarcation between harmful and so-called "harmless" blowholes is practically impossible to define. Is it not, therefore, the better and safer practice to use means for the elimination of blowholes and correspondingly reduce the segregation and allow the formation of a well-defined shrinkage cavity or pipe at the upper end of the ingot? With the relatively cheap deoxidizers available at the present time there is no commercial reason why all steel should not be thoroughly degasified.

MOLDS, LARGE-END-UP, THE BEST PRACTICE

A degasified steel being provided, the method of freezing or solidifying the liquid steel into an ingot, and the subsequent working into blooms and thence into various products is of great importance in reducing the crop or scrap portion of the steel, due to segregation and pipe. How to accomplish this reduction at a minimum expense and without upsetting the administrative mill practice of present plants is the problem. It has been my experience that the solidifying of an ingot made from steel which has been practically deoxidized or "killed" in the ladle, or in the mold, depends upon the shape of the horizontal cross-section of the ingot at its various planes from top to bottom, and also upon the thickness and consequent heat-absorptive power of the various parts of the mold walls. An ingot with its larger horizontal cross-sectional area at the top is without question the best shape for obtaining the important "lag" in solidification of the steel, and whenever such large-end-up ingot can be conveniently used it is the best practice to do so. Nearly all of our large mills are, however, so equipped for handling and stripping the ingots that it is practically impossible to do this without extensive changes in equipment.

It is, therefore, necessary to employ means in ordinary big-end-down ingots to greatly accelerate the freezing and solidifying of the lower and middle portion of the ingot and thus provide liquid metal to compensate for the decrease in volume caused by the contraction during solidification of the ingot. This I have accomplished by giving the lower 70 to 80 per cent of the metallic mold in which the ingot is cast a much greater degree of heat absorptive capacity than the upper 30 or 20 per cent thereof. This construction will be best understood by referring to Fig. 1. Many hundreds of molds of this kind have been in daily use under usual furnace and mill conditions during the past year. Designs of molds have been made and established in actual practice for from 1 to 10-ton ingots.

THE SINKHEAD ON THE LARGE-END-DOWN INGOT

In order to insure an ample supply of liquid steel to compensate for the shrinkage in the upper

Fig. 2—Two Left-Hand Ingots are Vanadium-Nickel-Chrome Steel Cast in Standard Ingot Molds; the other Two are the Same Grade of Steel Cast in Gathmann Large-End-Down Molds with Sinkheads

*From a paper to be presented at the one hundred and eleventh meeting of the American Institute of Mining Engineers at San Francisco in September, 1915. The author is manager of the Gathmann Engineering Company, Baltimore, Md.

rtion of the ingot in very dense, quick-setting el, it was found advisable to use walls of a material of poor heat conductivity in the uppermost portion of the mold to supplement the differential effect obtained by the combination of the heavy and thin mold walls by providing a sinkhead.

The usual type of sinkhead resting on top of the mold, or rigidly secured in the upper part of the mold cavity, was found not to fulfill all the conditions necessary in a commercial sense, primarily

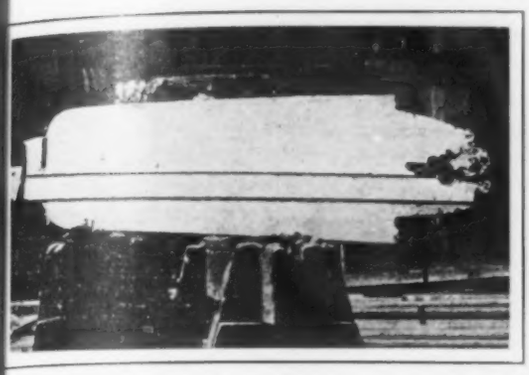


Fig. 3—A One-Ton Ingot Cast in a Gathmann Large-End-Up Mold

because of the high cost of such sinkheads when efficient. Sinkheads of this kind must be of sufficient thickness and strength to hold the liquid steel without cracking or breaking. Even a slight crack or break in the sinkhead is sufficient to form a fin of steel and hang the ingot during its vertical shrinkage, thus causing surface cracks and defects in the body thereof.

Fig. 1 shows a method of freely suspending within the mold cavity a sinkhead made of poor heat-conducting material. This type of sinkhead, in conjunction with the heavy-wall mold, has given most excellent results, and is in regular use by several of the largest high-quality steel works in this country, in conjunction with the mold having walls with a heavy body and thin top. Such a mold, if properly designed, will produce a sound homogeneous ingot with about a 20 per cent top crop, which is about 15 per cent less than is usually necessary in ingots of like grade of steel made in the old-type mold. Split ingots of vanadium-nickel-chrome steel, one cast in a mold of the standard type and the other cast in a Gathmann-type mold, are shown in Fig. 2. With a sinkhead in combination with the type of mold described the crop necessary to eliminate pipe and segregation is approximately 10 to 12 per cent of the cold ingot.

The physically homogeneous condition of the ingot is obviously of primary importance in producing sound blooms and finished products. Irrespective of any heating and mill practice which it may be desired to use at any specified mill, the physical condition of cold ingots split open for inspection is undoubtedly the true index to the value of any method for producing sound, homogeneous steel.

The theoretically ideal method of making sound, homogeneous steel is undoubtedly with the big-end-up mold, because the increasingly large area of the ingot toward the top compensates automatically for any irregularities in the temperature of the steel or in the teeming practice. The method I propose for utilizing the big-end-up mold in car practice was fully described in my previous paper before this Institute in 1913. Fig. 3 shows a split ingot produced by my method under normal conditions with the big-end-up practice, the crop for piped section being approximately 5 per cent.

The Year's Foreign Trade

In exports of domestic products, in aggregate value of foreign trade, and in favorable balance of trade the United States made a new high record in the fiscal year ended June 30, 1915. Imports and exports combined totaled $4,442,864,272, an increase of $184,000,000 over 1914 and of $164,000,000 over 1913, the prior high-record year in total trade.

Exports in 1915 totaled $2,768,643,532, an increase of $404,000,000 over 1914 and of $303,000,000 over 1913. Imports aggregated $1,674,220,740, a decrease of $219,700,000 from last year's total and of $138,800,000 from that for 1913.

The excess of exports over imports for the year 1915 was $1,094,422,792, which sum exceeded by $428,000,000 the former high record made in 1908 and by $623,800,000 the export balance for 1914.

June, 1915, exports were $268,601,599 and exceeded by $111,530,000 the total for June last year. June imports were $157,746,140, or less by $216,690 than those for June, 1914, but $26,500,000 more than those for June, 1913.

Of the June, 1915, imports 62.94 per cent entered free of duty, compared with 59.32 per cent for June, 1914, and 50.88 per cent for June, 1913. Of the year's imports 61.73 per cent were duty free; in 1914, 59.43 per cent.

The year's gold movements included imports, $171,568,755; exports, $146,224,148. In 1914 the figures were—imports, $66,538,659; exports, $112,038,529. The month of June, 1915, reversed the conditions shown in June last year, June gold imports having been $52,341,740 this year and $3,817,112 last year, while gold exports last month were only $2,821,988, against $48,107,064 in June, 1914.

Distribution of Russia's Iron and Steel Industry

Russia's iron and steel industry is distributed as follows, according to data compiled from the official statistics:

	South Russia	Urals	Moscow	The Volga	The North and Baltic	Poland	Total
Blast furnaces	63	121	46	..	11	28	269
Bessemer converters, acid	16	2	..	..	2	3	23
Bessemer converters, basic	10	..	..	..	..	..	10
Tropenas and Robert converter	5	1	..	..	2	1	9
Open-hearth furnaces	88	68	22	13	31	37	259
Crucible furnaces	..	8	..	..	33	1	42
Heating and welding furnaces	341	579	47	16	132	90	1,205
Puddling furnaces	..	72	33	..	15	32	152
Men employed	87,871	113,758	29,424	13,642	30,857	..	275,552

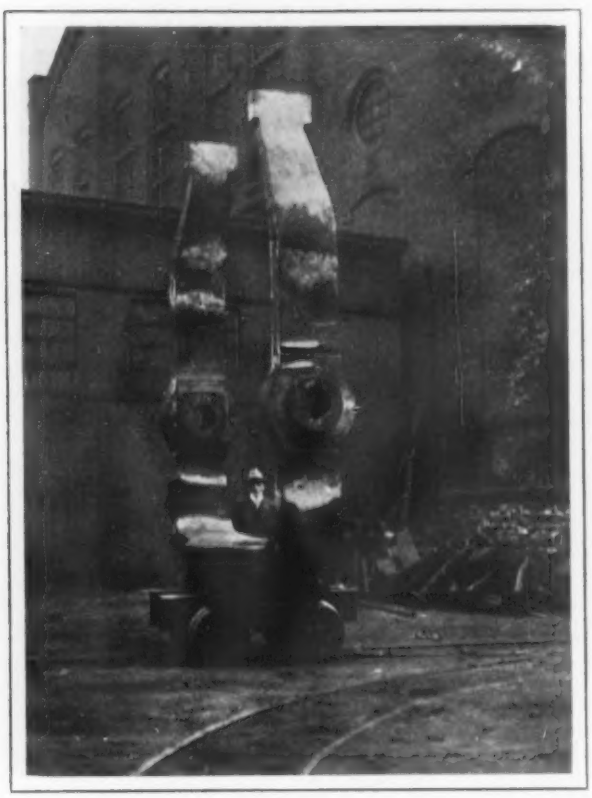
The total open-hearth capacity is estimated at 5785 tons per heat, of which about one-sixth is located in Poland and practically in German hands. Blast furnaces state-owned are put at sixteen and the privately owned at 153. Iron and steel works state-owned are nine, while eighty-five are listed as privately owned. About 10 per cent of all types of furnaces are in Poland.

The Bucyrus Company, South Milwaukee, Wis., maker of excavating machinery, is rapidly reaching the overtime schedule. E. K. Swigart, vice-president says: "Reports from our agents all over the country and foreign countries as well indicate that a revival in business has set in." In the past week the company has booked large orders for export, among them two dredges for Africa and one to the Federated Malay States. The source of business is principally reclamation and mining work. Orders already on hand insure continuous full time operations well up to the new year.

Great Britain's excess of imports over exports for the first six months of 1915 was £194,158,000, or a little more than three times that in normal times, the excess having been £61,169,000 in the first half of 1914.

An Unusual Forging of Large Dimensions

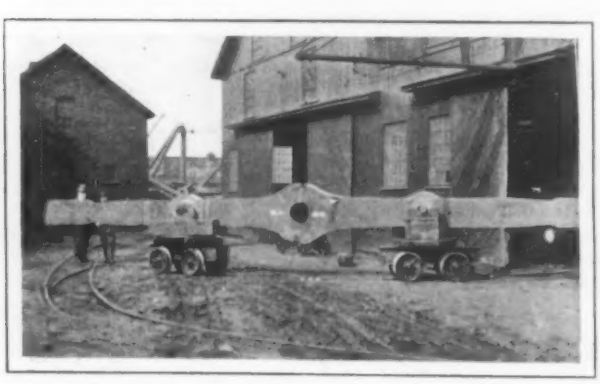
Recent developments in the use of the self-unloading stone-boat on the Great Lakes have made necessary an unusual yoke forging. A forging of this character, recently made by the De Laney Forge & Iron Company, Buffalo, N. Y., is shown in



The Forging Bent to Shape

the illustrations. In the rough, as forged only, it was 48 in. wide by 10½ in. thick in the center, and a little over 42 ft. long. Its weight was 24,000 lb. One of the illustrations shows the forging slotted, planed, bored and milled, that is to say, with all machine work done before it was bent to the shape desired. To prevent it from falling over, it was blocked up on a short 7-in. shaft which was placed through the trunnion holes. The forging bent to shape, ready to ship, is shown in the first of the cuts. The extreme width is 9 ft. 11 in. and the extreme height is 13 ft. 2 in. The finished weight is 19,500 lb.

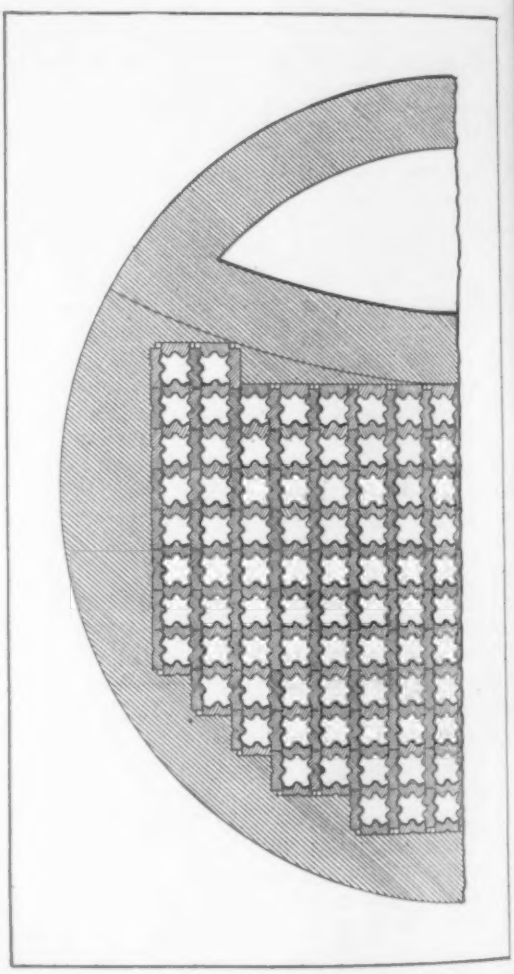
The yoke forging will enter into the construction of the unloading machinery to be installed in the steamship W. F. White, which was launched on Saturday, July 24, 1915, by the American Ship Building Company at its yard at Lorain, Ohio. This ship is 550 ft. long and is designed to carry 85[illegible] tons. The unloading mechanism is to unload her cargo at the rate of about 2000 tons per hour. This forging carries the boom, the hopper and the machinery operating the main carrier belt, which is driven by an 11-in. shaft extending upright through the center hole. The boom is carried on the mill[illegible] trunnions, and will deliver the cargo of the steamer on any dock 150 ft. from the center line of the ship.



The 24,000-lb. Forging After Machining

A New Type of Brick for Hot-Blast Stoves

Bricks commonly used in hot-blast stoves for blast furnaces have had flat or approximately flat faces, and to secure sufficient strength they have had to be made of a thickness which has involved a considerable volume of brickwork serving little or no use in absorbing and giving out the heat. That is, the volume of the brickwork is thus disproportionate to the surface exposed to the burning gas and the air is the basis on which bricks with corrugated faces have been designed, on which a patent (U. S. 1,142,838—June 15, 1915) has been granted to Marvin A. Neeland, 71 Broadway, New York. The corrugations are so arranged as to increase the extent of the exposed surface without decreasing the volume below that necessary for strength. The illustration shows a horizontal section of a hot-blast stove of the two-pass type containing the new brick. In a three-pass type of stove the shape and arrangement of the brick are different but the same principle applies.



Horizontal Section of a Two-Pass Hot-Blast Stove with Corrugated Brick

It is claimed that a stove of this design may be made much smaller than the previous standard for

curing a given heat effect; or, if the same size as e of the previous design, it will provide a greater ating effect. Each brick has two complete corru- tions and these are so arranged that the inward ojection on each one is in radial line with the ward depression on the opposed face of the next e and the outward projections and depressions milarly. This is claimed to provide a greater rength circularly of exposed faces in each of the ertical passages, maintaining the necessary volume brickwork to support the weights and providing greater radiating surface.

A Historic Converter

The striking feature of the exhibit of the Cambria Steel Company in the Palace of Transportation the Panama-Pacific International Exposition, San rancisco, is the Kelly steel converter that was used

e Central Feature of the Cambria Steel Company's Exhibit at the San Francisco Exposition

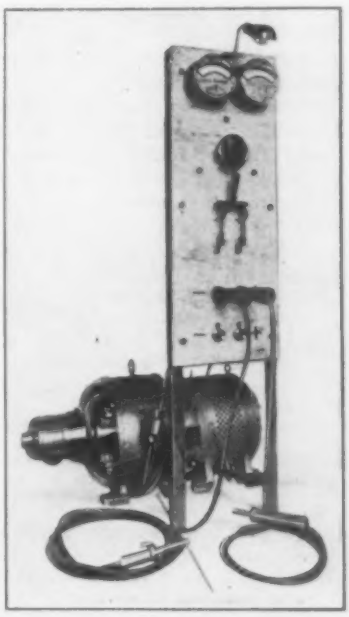
the Cambria Iron Works in 1861 to 1862. Men- on was made of this fact in the brief summary exhibits at the exposition, given in THE IRON GE of July 15, but herewith is a reproduction of a otograph of the converter itself, which is labeled, The Pioneer Converter of America." No attempt made by anything in the exhibit to open up the spute relative to priority of claims to the inven- on credited to Sir Henry Bessemer of the pneu- atic process of making steel, a question which was gitated somewhat warmly in 1896.

The Toledo Machine & Tool Company, Toledo, Ohio, as recently made some factory extensions and im- rovements. Among them was the installation by the oledo Bridge & Crane Company of a 20-ton yard rane with a 300-ft. runway. The factory crane run- ay has been extended 70 ft., giving an erecting space nder the crane of over 600 ft. The company reports heavy demand for presses for use in manufacturing ells, but with its increase in capacity, and by running ll force night and day, it is able to make good de- veries. It has recently received some large orders for achines for shipment to England, France, Italy and ussia. Among these orders are several for 155,000- special type presses for use in making howitzer ells.

The H. & A. Lock Company has removed from 156- 0 Sixty-third Street, Brooklyn, N. Y., to its new fac- ry at 243-249 Forty-fourth Street, Brooklyn.

Arc Welding Machine with Panel Board

An arc welding machine which is claimed to be designed so that no resistance is required in the circuit with the arc has been developed by the Lincoln Electric Company, Cleveland, Ohio. This feature is secured by a design that causes only the exact amount of voltage required by the arc to be generated at all times, while the current is practically constant. Special windings in the generator are employed to secure this, with the result that the method of control is simplified.



A Recently Developed Arc Welding Machine Complete with Panel Board. The terminal at the right is connected to the piece to be welded while the electrode holder with the electrode in place is shown at the left

The panel board is mounted adjacent to the machine, as shown in the accompanying illustration. The terminal at the right is intended to be connected to the piece that is being repaired, while the electrode holder, which contains the metal electrode, is connected to the left terminal.

The simplified control, it is pointed out, is an advantage, as welding machines, as a rule, are operated by men who are neither electricians nor mechanics. To take care of the emergency service that is frequently demanded in arc welding plants these machines are designed to sustain overloads and be operated for long periods.

A Six-Cylinder 100-H.P. Diesel Oil Engine

A vertical four-cycle six-cylinder 100-hp. non-reversible Diesel engine has been completed by the Fulton Mfg. Company, Erie, Pa. This engine is really two of the 50-hp. units which were illustrated in THE IRON AGE, April 2, 1914, coupled together. A two-stage air compressor is mounted on the same crank-case as the cylinders and is driven by the engine shaft. Either crude or fuel oil is used.

The first stage of the air compressor compresses the air from 75 to 90 lb. and the second stage raises the pressure to from 800 to 1000 lb., the air being stored in an injecting air bottle from which it is admitted directly into the cylinders through fuel injectors. These are located on the top of each cylinder and oil is pumped into them from the individual fuel pumps located on the sides of the cylinders. After being mixed with the air the oil is discharged into the cylinder when the inlet valve is opened mechanically. The air supplied by the compressor is more than is actually needed for running and the surplus is stored in two steel bottles for use in starting the engine when it is admitted into three of the six cylinders. The fuel pumps for each cylinder are equipped with push-button control so that one or more cylinders can be cut in or out as may be found desirable for the most efficient operation under varying conditions of load to which the engine may be subjected.

Lubrication is of the forced feed type and the lubrication pump is interchangeable with the one employed for pumping the fuel oil from the main tank to the smaller reservoir located above the engine.

STATUS OF FERROMANGANESE

The World's Available Supply of Alloy and Ore Greatly Lessened

The new restrictions on exports of ferromanganese from Great Britain, notice of which was contained in the London cablegram to THE IRON AGE of July 29, have a vital bearing on the steel industry of the United States. England's supply of manganese ores, as well as that of the United States, come principally from Russia, India and Brazil. Russia is cut off; India's supplies are hard to get and embargoed so far as this country is concerned; Brazil had been furnishing only 9½ per cent of the world's output. Normally half our ferromanganese is imported, nearly all the imports coming from England. The following analysis of the situation to July 1, 1915, is interesting:

MANGANESE ORE

Imports into the United States, Gross Tons

	1913	1914	1915
Total for the year	345,090	283,294	...
Average per month	28,757	23,608	...
Total for first half	...	...	58,148
Average per month	...	...	9,691

The average importation for five years (1910 to 1914) was 269,649 gross tons per year or 22,470 tons per month.

Manganese ore imports into Great Britain, Gross Tons

	1913	1914	1915
Total for the year	601,177	479,435	...
Average per month	50,098	39,953	...
Total for first half	...	244,465	134,526
Average per month	...	40,744	22,431

India: Manganese ore exports were only 76,666 gross tons for the first four months of 1915 as compared with 223,300 tons for the same period in 1914 or 65.7 per cent less. Exports in April were 75.8 per cent less than in April, 1914.

Russia: Exports of manganese ore were 37 per cent less in 1914 than in 1913 or 737,300 metric tons against 1,171,000 tons.

Brazil: Exports of manganese ore to Great Britain and the United States in 1914 were 132,570 gross tons against 88,992 tons in 1913, an increase of 43,578 tons. While exports from Brazil are increasing our receipts from that source in the first four months of this year, were only 10,492 tons.

With England's imports nearly 50 per cent less than those of 1914, 22,431 against 40,744 tons, and with the price of ore there standing at 57c. per unit for Brazilian and at 33c. to 35c. for Indian one cause of the announced restrictions is not hard to fathom. A recent sale of Brazilian ore in the United States was at 41c. per unit, Atlantic port.

FERROMANGANESE

	Gross Tons
Average imports per year into U. S., 1910 to 1914	100,793
Average production per year, 1910 to 1914	99,363
Total apparent consumption per year, 1910 to 1914	200,156
Average imports per month, 1910 to 1914	8,399
Average production per month, 1910 to 1914	8,280
Total apparent monthly consumption	16,679
Imports for the first half of 1915	21,000*
Production for the first half of 1915	45,300†
Total available supply	66,300
Total available monthly supply	11,050*
Total average monthly importations, first half of 1915	3,500*
Total average monthly production	7,550†

*Partly estimated.
†From THE IRON AGE's monthly blast furnace reports.

In 1913 the average monthly imports were 10,672 gross tons and the average monthly production 9958 tons, giving an apparent monthly consumption of 20,630 tons. The available monthly supply for consumers outside of the leading interest was only 3500 tons in the first half of 1915, against a 5-yr. average supply of 8400 tons per month for such consumers.

From the above data it is evident that the situation is not reassuring. With August shipments from England reduced to a very small amount, it is extremely unlikely that the orders to conserve in England three months' supplies of the alloy and of the ore will release much for this country for some months to come. Our monthly imports of the ore have decreased over 50 per cent and the average of our monthly imports of the alloy this year has been 60 per cent less than that for five years previous. This year's imports and domestic production to July 1 were nearly 50 per cent less than the consumption per month in 1913 and 33 per cent less than the average monthly consumption for five years.

The production of steel in 1913 was 31,300,000 tons of ingots and castings. It is estimated that the average consumption of ferromanganese is one ton for every 125 tons of steel produced. If the operating rate of the steel industry is at 28,000,000 tons per year for the last half of this year, then 112,000 tons of ferromanganese will be necessary. With British supplies nearly cut off, and manganese ores hard to get, it is difficult to see from what source this amount is to come. Even with a partial substitution of spiegeleisen, the success of which is variously regarded, the situation is tense.

Large Zinc Exports, Due to the War, Growing Less

While the war has revolutionized our export trade in zinc in the form of pigs, bars, plates and sheets, the Government statistics for May, just issued, show that the foreign demand is gradually lessening. The following table gives the exports for the eleven months of the fiscal year:

1914	Gross Tons	1915	Gross Tons
July	140	Jan.	13,25
Aug.	3,079	Feb.	13,39
Sept.	17,005	March	7,26
Oct.	9,160	April	7,49
Nov.	11,381	May	6,67
Dec.	16,354		

This shows that the high points in exports were reached in September and December last year with a constantly decreasing tendency since, until in May they were only 50 per cent of those of January, but even then nearly equal to the total exports for 1913 which were 6949 gross tons. In 1914 they were 57,859 tons, of which 57,119 tons was shipped in the war period, Aug. 1 to Dec. 31. For the eleven months ended with May 31, 1915, the total exports were 106,138 gross tons against only 1543 tons in the same period in the preceding year.

New Export Sales Agency

George Schow, suite 717, 624 South Michigan Avenue, Chicago, Ill., has organized the Foreign Trade Service Bureau for the purpose of developing export trade to Europe. With assistants he will leave in a few weeks for Russia, Norway, Sweden, Denmark, England and France to organize a chain of sales agencies for leading American manufacturers. Mr. Schow has spent many years in the foreign field, having built several manufacturing plants in Europe and equipped them with American machinery and tools. He will represent manufacturers of machine tools, pneumatic tools, iron, steel and brass goods, automobiles and automobile parts, auto trucks, gasoline engines, motor boats, etc. His foreign representatives are good linguists, thoroughly posted on the lines to be handled, costs, values, selling methods, foreign customs, etc. Only a limited number of manufacturers will be represented, none of whom will conflict. Mr. Schow, with assistants, will be located permanently abroad, visiting connections in the United States once a year or so to keep posted on the lines handled. A branch office will be maintained in Chicago as a clearing house for subscribers to the service.

The Hanna Engineering Works, 2059 Elston Avenue, Chicago, Ill., have developed a vertical type of suction lubricator for compressed air machinery. The general construction and principle of operation it is the same as the universal type brought out some time ago. While the universal lubricator can be attached to the air line in any position, the new style can be used only in vertical air lines. A chamber containing an absorbent is kept saturated from another large oil storage chamber surrounding it. The air passing through the lubricator receives oil and lubricates the surfaces with which it subsequently comes in contact. The operation of the oiler is automatic, taking place only while air is moving in the pipe line. Three sizes of oiler are made for use in ¾, 1 and 1½ in. pipe lines.

Book Reviews

Purchasing: Its Economic Aspects and Proper Methods. By H. B. Twyford of the Otis Elevator Company. Pages, 252, 6 x 9 in.; illustrations, 112 charts and diagrams. Published by D. Van Nostrand Company, New York City. Price, $3.

Mr. Twyford has made no specific attempt to codify rules and regulations for the adoption of others in purchasing, but has sought to elevate and broaden the conception of those who perform as well as of those who undervalue this vitally important function of commercial life. Herein he attempts a large task, the full performance of which cannot be speedily realized because it involves education, emancipation from the bonds of precedent and broad readjustment of official functions difficult to accomplish. Mr. Twyford has made the start.

Throughout the work the author has interspersed his descriptions with carefully planned diagrams and charts. The final pages are almost exclusively devoted to various special printed forms merely suggested as labor-saving devices applicable, in limited fields, to specific work. Trade practices, traffic conditions, storehouse control, inventory maintenance, catalog storage, requisitions, quotations, orders, receipts, invoices, sources of supply records, previous price records, transportation charges, discounts, follow-up systems and many other clerical operations of this active line of work receive consideration and are given clear exposition by one eminently fitted to do it.

The book is one that appeals to those actively engaged in purchasing, or to those interested in industrial organizations. As no effort has been made to popularize the subject the author's treatment will seem prosy to the casual reader. Those having a deeper interest will welcome Mr. Twyford's contribution for the value of the vision it contains and the ideal it sets for purchasing that shall command respect both within and beyond the realm of that activity. E. F. W.

Poor's Manual of Public Utilities for 1915. Text pages, 2280, 5¾ x 8¾ in. Published by Poor's Railroad Manual Company, New York. Price $7.50.

This is the third annual number of this important manual, which is unique in being devoted exclusively to public service corporations. It contains statements of subsidiary, controlled and affiliated companies in connection with the statement of the parent company. In each case are given, where available, the latest published annual income accounts and balance sheets, in most cases in comparative form for a number of years, showing at a glance any change in the trend of the companies' business. All consolidations and reorganizations up to June 1, 1915, are recorded. The names of the merged companies are listed in the general index, so that they may be referred to readily. This book is the second of the series of three books devoted to the reports of American corporations. The first, "Manual of Railroads," was issued in January, and the third, "Manual of Industrials" will be issued in a few weeks. The publishers have issued various corporate and financial compilations for nearly fifty years.

Practical Shop Mechanics and Mathematics. By James J. Johnson. Pages, 1 + 130; 4½ by 7 in.; illustrations, 81. Published by John Wiley & Sons, Inc., New York. Price, $1.

This book, which is dedicated to the "ambitious workman," adds another to the list of books written with the commendable object in view of eliminating the mysterious element that usually surrounds shop mechanics. The book opens with a chapter on materials wherein the different kinds of iron and steel are described in a concise manner, and brief descriptions are given of the other metals commonly used in machine design. There are also comprehensive paragraphs on concrete and timber. This opening chapter is followed by one on measures and weights, with which is included a description of the micrometer and the vernier.

Then follow chapters on pulleys and belting and on gearing, wherein shop rules for pulleys and belts are given, and the applications of gearing in a lathe are discussed at some length. Next come chapters on force and its relation to work. By means of simple and comprehensive illustrations the author presents the elements of mechanics in a manner that would seem of material value to the beginner.

These chapters are immediately followed by one on stress and strain. The closing chapter on angle measurements presents, briefly, the elements of trigonometry. Interspersed throughout the book are problems calculated to stimulate application of the principles dealt with. An appendix having tables of areas of circles, squares and cubes, and sines and tangents, together with a fairly complete index, concludes the book.

Guide Book of the Western United States. Part B, the Overland Route. By Willis T. Lee, Ralph W. Stone, Hoyt S. Gale and others. Pages 244, 6 x 9 in.; illustrations, 26 map plates and 50 halftone plates. Published by the United States Geological Survey and obtainable from the Superintendent of Documents, Washington, D. C. Price $1.

In the preface of this book, George Otis Smith, director of the United States Geological Survey, explains that this is one of four guide books in process of preparation covering four of the oldest railroad routes west of the Mississippi, and that they are being compiled to help the traveler study the geography of his country at first hand. The maps comprise a series to be taken up as one passes over the line of the Union Pacific from Omaha to San Francisco, with a side trip to the Yellowstone Park; and the maps are interspersed through the book so that the reading matter covering the places of interest is in proximity to the maps. The halftone pictures refer to geological formations as well as scenic attraction.

The plan is to present information, not merely on present-day conditions, but on the basis of the development of each section. Considerable is given of the probable prehistoric conditions, of the successive geological changes which have some bearing on the present and of the discoveries and works of man in each locality. The book is not a Baedeker, as it does not essay to cover the ephemeral conditions of taxicab rates, hotel accommodations and local sight-seeing trips, but gives information which few would otherwise be able to gather.

The Survey has performed a decided service in the publication of this book, which is obviously cheap at the stated cost of $1. It appears that the limited printing appropriation makes it impossible to print an adequate free edition. There is no provision under the law by which a government book can be handled through the usual commercial book selling channels, and to secure the book it will be necessary to send to the Superintendent of Documents, Washington, D. C., enclosing $1.

Purchasing. By C. S. Rindsfoos, C.E. Pages, X + 165; 6 x 9 in. Published by the McGraw-Hill Book Co., Inc., New York. Price $2.

Essentially a text-book in form and feature, this work offers profitable reading to anyone even remotely interested in industrial or mercantile life. Avoiding complexity throughout, the author rapidly passes from phase to phase of his subject, briefly describing the character of knowledge necessary for purchasing and where to secure it; the methods of insuring deliveries and obviating unnecessary delays; the desirability of definite policies; the importance of favorable terms, and the personal and mental qualifications of the purchasing agent. A chapter on "Some of the Legal Aspects of Purchasing" and one on "Departmental Organization" have a greater value to the experienced buyer than other portions of the work, with the possible exception of the fifty odd pages of forms applicable to the details of general and special purchasing with which the volume concludes.

The book is elemental, of course; the field being too extensive to permit a thorough analysis in so brief a form. It secures brevity at times by failing to give

sufficient explanation for unsupported assertions. In the opening paragraph, the author declares "ninety-nine purchasing agents out of ninety-nine work on the theory that price is the most important consideration." The purchasing agent who is worthy of his hire will resent this reflection on his intelligence and on that of others capable of qualifying for his duties. Had the author considered that many purchasing agents are chosen from the ranks of technical men, trained like himself in the engineering field, where ultimate economy is their vision of truth, his statement might have been modified.

After honesty, broad-mindedness and tact are rightfully placed by Mr. Rindsfoos as necessary qualifications of the purchasing agent. They are equally necessary attributes of his commentator; and both require, in addition, the ability to clearly analyze conditions and men. A chapter of more than 12 pages is devoted to "Strategy." This may be necessary, but one searches in vain for the word that is becoming the key-note of successful purchasing—co-operation. E. F. W.

New Carnegie Shape Book

The Carnegie Steel Company has issued the fifth edition of its Shape Book, which supersedes the fourth edition made in 1911. A comparison of the two books shows the progress which has been made in the introduction of rolled steel to an increasing number of industrial lines. The new book has 312 pages against 256 of the 1911 issue, and much of these additional pages are given over to new sash and casement sections used in the construction of metal window frames, skylights and the like, and to a large number of automobile sections as well as to an additional number of structural sections, mostly of lighter weights of existing general sizes.

A detailed description of the book is not necessary, as in the publication of profiles, tables and data pertaining to shapes, bars, plates, rails and track accessories, it follows the presentation of the earlier books. The typography has been improved and a special thin paper has been employed so that although having over 50 pages more than the last edition, the new book is actually thinner. In respect to the new sections shown, mention may be made that besides the numerous lighter weight beams, channels, angles and the like which have been added, the book shows a 27-in. I-beam weighing 83 lb. per foot, a new 21-in. I-beam and a 3½ x 6½-in. angle. A heavy 13-in. channel is also noted and a new heavy 6 x 6-in. angle. The tables on plates cover also nickel steel plates, and in rails 60 and 70-lb. sections of the American Railway Association rails are listed. A copy of the book may be obtained from the Carnegie Steel Company, Carnegie Building, Pittsburgh, at $1 per copy.

The Man Factor Foremost in Accidents

That a great majority of industrial accidents can be prevented only by the man on the job—by the workman himself—although the mechanical safeguard has gone a long way toward accident prevention, is the burden of a bulletin entitled "Wisconsin's Movement for Industrial Safety," issued by the Industrial Commission of Wisconsin. The bulletin gives a table showing industrial accidents during thirty-one months ended April 1, 1914, to have been 21,374 in number, incurring a total cost in compensation and medical aid of $1,936,000. The distribution of accidents among causes, the bulletin says, shows that the great majority of accidents are not preventable by guards. Even with more extensive guarding of machinery, stairways, etc., and all danger points made safe by mechanical safeguards, the human element leaves the way open to many injuries which could be avoided by exercise of care by the employee. The table shows fatal accidents numbering 429; serious and permanent injuries, 139, and minor accidents, 20,806. The commission concludes that for every establishment having 500 accidents, there were approximately 500 small shops which had no accidents whatever in that year. The bulletin cites many striking object lessons showing that employe who objected to commission activities in the directio of safeguarding machinery and equipment were amon the first to feel the benefits thereof or the damage re sulting from the lack of safeguards or the refusal t install them.

Spencer Wire Company Profit Sharing

The Spencer Wire Company, Worcester, Mass., ha adopted a profit-sharing system in the form of a wag dividend. A trial is to be made for one year fro July 1, 1915. From a circular to the company's em ployees the following is taken:

The company desires to interest you in its financial resul and is willing to share its profits. It hopes in return that th profits will be increased by the employees taking a personal interest in the continued success of the business, leading the to exercise the greatest possible care to prevent bad wor and waste of time and material. Also to encourage increase production and suggestions for improvements of any nature It seeks to avoid frequent changes, for an experienced em ployee is of more value than a beginner. One of our employe has been with us fifty-eight years, and a number of them ov fifty years. We want all to stay with us steadily, rathe than change occasionally or frequently, for you can do a well here as anywhere. You can help by encouraging you fellow workman to stick to his position and assist in securin desirable fellow workmen. You can assist by seeing tha others do not carelessly waste or destroy our property, an by looking out for small savings which in themselves do no amount to much but in the aggregate are very important.

Profit sharers shall be those on the company's pay ro July 1, 1915, who remain continuously in our employ durin the twelve months next ensuing, and whose services shall b satisfactory to the company. Any on the profit sharers' li who may be discharged, or who may leave our employ, o who shall be deemed unsatisfactory, during the twel months period, will forfeit all claim to share in the divisi of profits that year. The amount thus forfeited will not b saved to the company, however, but will be carried to benefit fund, out of which the directors of the company ma grant assistance to aged or disabled employees. Whethe absence from work, resulting from sickness or disability, sha be deemed a break in the continuity of employment shall b decided in each case at the company's discretion, but in n case shall a dividend be paid on wages not actually earne The company reserves the right, at its discretion, to remo any unsatisfactory employee from the profit sharers' list from its employment.

In accordance with this plan, as soon as practicable aft July 1, 1916, profit sharers will be paid a wage dividend o the actual years' wages received, reckoned at the same ra per cent as the shareholders of the company receive in ca dividends on their stock. The expected cash dividend to b paid the stockholders of the company during this period six per cent; but, if by your efforts and the successful con duct of the business the earnings of the company should war rant a larger dividend to the stockholders, the same increas rate of dividend shall be paid on your wages.

In the event of the death of an employee whose name upon the profit sharers' list, the company, at its discretio may pay to the husband, wife, children, next of kin, or pe sonal representative of the deceased, a wage dividend up his wages earned.

The Spray Mfg. Company, 201 Devonshire Stree Boston, Mass., which was recently incorporated to co struct spray cooling systems, gas scrubbers, odor an fume condensers, etc., will carry on general engineeri work involved in the use of spray systems, and, owi to the broadening of the scope of its work, has chang its name to the American Spray Company. The pe sonnel of the company remain unchanged, with A. Eneas president and chief engineer.

A new counting machine that can be used for reg tering either strokes or revolutions has been plac on the market by the New Haven Trolley Supply Co pany, New Haven, Conn. Like the other counters this company, the new type is full geared, which is r lied upon to prevent over or under counting, and interesting arrangement of the mechanism permi either rotary or reciprocating motion to furnish t power required for operation.

Wage Advance for Machinists

At New Haven, Conn., the Winchester Repeating Arms Company announced last week a reduction in working time from 55 hr. to 48 hr. a week, beginning Aug. 16, all rates for piecework and hourly work to be increased so as to yield them the same pay in 48 hr. as at present in 55 hr. The company's statement says that the normal and standard working schedule of the shops will be 48 hr. for both day and night shifts. For the day shift, all time in excess of 12 hr., Monday to Friday inclusive, and in excess of 5 hr. on Saturday, and all time on Sundays, will be subject to a bonus of 50 per cent, or time and one-half. For the night shift a similar increase is announced to include all time in excess of 12 hr. Monday to Friday, and all time Saturday and Sunday nights. The company states that under present conditions it is necessary for certain jobs to continue the present working hours, but all will receive the increase in piece and hourly rates provided for.

At Ilion, N. Y., piece workers in the plant of the Remington Arms Company went out on strike Monday, Aug. 2. The strikers are not organized. The trouble is reported to be due to a difference in interpretation of the adjustment made two weeks ago at the time of the Bridgeport strike, when working hours were reduced from sixty per week to forty-eight. As wages were kept the same, the advance in the rates to day workers was 25 per cent, whereas piece work was advanced but 15 per cent.

A Hartford, Conn., dispatch states that employees of the Colt Patent Fire Arms Mfg. Company, were informed July 31 that a bonus of 12½ per cent will be paid for the year beginning May 1, based on wages earned.

At Bridgeport, Conn., the Locomobile Company of America has given notice of a profit-sharing plan, the size of the bonus being determined by the amount of increase in output.

The International Motor Company, Plainfield, N. J., notified its employees that beginning Aug. 2 the day's work would consist of eight hours and that in addition the men will receive a bonus. These increases are to apply also to the employees of the Allentown, Pa., plant.

The plant of the Garvin Machine Company, New York, was closed down Aug. 2 owing to a strike by the machinists, ordered by the International Association of Machinists. The demands are for a 15 per cent increase in wages and an eight-hour day. The company had proposed to grant a 10 per cent advance, going into effect in six months. Henry C. Hunter, representing the National Metal Trades Association, said: "The union officials have demanded 15 per cent increase of pay and an eight-hour day instead of nine hours. Last week Mr. Garvin offered 10 per cent increase of pay, but would not consider the demand for shorter hours. The output in this industry, excepting munitions of war, is from 40 to 50 per cent below normal. There are thousands of machinists out of work in this city. Many of the shops are running at a loss. A worse time from the standpoint of the workmen could not be picked out for a strike."

German Steel Output for May

Germany's steel production in May, as published by the Association of German Iron and Steel Masters, was 1,020,515 metric tons compared with 1,012,334 tons in April of this year. The May output consisted of 541,228 tons of Bessemer ingots, 418,037 tons of open-hearth ingots, 45,850 tons of steel castings, 8232 tons of crucible steel and 7468 tons of electric steel.

The Knickerbocker Cement Company's large power plant near Hudson, N. Y., was wrecked by the sinking of the ground beneath it on Aug. 2, five men losing their lives. The plant was built four years ago at a cost of $250,000, and from time to time many of the workmen had complained that it was settling. It sunk about forty feet, presumably in quicksand.

Bethlehem Steel Company Advances Wages

The following announcement of an advance in wages was made by President E. G. Grace to the employees of the Bethlehem Steel Company, South Bethlehem, Pa., July 31. It is stated that the increase will average about 10 per cent. The payroll for some time has been on the basis of $1,250,000 monthly:

> The management of the company has decided to grant an increase in its rate of pay, taking effect to-morrow, Aug. 1. This increase will apply to all departments of the works. This action is done in recognition of the loyal and faithful service the company has received from its employees, and is made possible at this time by the general improvement in business conditions, resulting in the operation of both the Saucon and Lehigh plants on virtually a 100 per cent working basis.

The production of ingots at the Saucon and Lehigh plants is now about 60,000 tons a month. It is expected that another blast furnace will be blown in shortly.

N. & G. Taylor Company to Make More Steel

The N. & G. Taylor Company, Philadelphia, manufacturer of steel bars, billets and tin plate, announces that it proposes to increase again the steel-making capacity of its plant at Cumberland, Md. Bids are being asked on another open-hearth furnace and other equipment made necessary by the increase in the steel output. Six months ago the company completed extensive additions to its open-hearth department with a view to the future, but they have already proved inadequate. It is worth noting, the company says, "that practically our entire output for the remainder of this year has been sold and that this is due almost entirely to increase in our domestic business, as we have taken no war orders and our export sales are a very small part of our total tonnage of sales."

Gould Coupler Strike Called Off

The strike of the molders and core-makers which has been running for eighteen months at the plant of the Gould Coupler Company, Depew, N. Y., has been called off by the unions. It is understood that the company made no concessions to the men, although it is stated that a number of the strikers will be taken back as soon as practicable. Evidently, those in charge of the strike became discouraged as the months ran on without serious embarrassment to the company, which kept its various departments running steadily. The early months of the strike were marked by considerable violence, and for a time State troops were required to maintain peace.

The Gravois Foundry & Mfg. Company, St. Louis, Mo., recently incorporated, will begin the construction and equipment of a foundry at Delor and Thirty-eighth Streets. The initial building will be 60 x 150 ft., of steel construction, with walls almost entirely of glass. It will be a high one-story structure. W. B. Jones and Frank Kroupa are the holders of the chief stock interests in the new company.

The Harris-Stevens Company, Pittsburgh, Pa., a partnership existing between William J. Harris and Ira E. Stevens for the manufacture of mine equipment, has been dissolved by mutual consent. Mr. Stevens has retired and the business will be continued by William J. Harris at 1104 Empire Building, Pittsburgh.

The Metals Coating Company of America, 122 South Michigan Avenue, Chicago, announces the opening of a New York City office at 30 Church Street, in charge of Edward McFarlan. The Boston office of the company is in charge of Herbert Jaques, Jr., and is located at 100 Sumner Street.

The membership of the American Foundrymen's Association recently passed the 1000 mark. The association's annual convention will be held at Atlantic City, N. J., in the week of Sept. 27.

ESTABLISHED 1855

THE IRON AGE

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Pig Iron Is Improving

Three weeks ago, under the caption "What Is the Matter with Pig Iron?" THE IRON AGE discussed the case of pig iron at some length, endeavoring to throw light upon the fact that pig iron had not advanced, when the steel market had turned from a severe depression into a condition of marked prosperity. Since that discussion was published the pig-iron market appears to have taken stock of itself and concluded that at length really nothing was the matter. At any rate, there has been a distinct advance. In most markets prices are quoted higher, while in all markets there is a firmer tone. Southern iron is up to $10, Birmingham, as a minimum, and eastern Pennsylvania, Buffalo, Cleveland and the Valleys are all quoting higher prices than a very few weeks ago.

Despite the fact that the pig-iron market is now aroused from its lethargy and foundry grades have advanced equally with steel-making grades, it is evident that the merchant furnace interests rest their hopes for a sharp further advance in pig iron more upon demand by steel works than upon demand from foundries. In the Pittsburgh-Valley district the chief topic in the pig-iron market is whether the large steel works will eventually buy iron freely. This does not mean that they have no right to have hopes for the foundry trade; the mental attitude is simply a reflection of the fact that the steel industry deals in very much larger tonnages than the foundry iron industry, and the demand of the steel trade for pig iron is more or less an intermittent demand, while the demand for foundry grades, including standard foundry, malleable and a limited tonnage of gray forge, is continuous. The foundries consume pig iron all the time, and their consumption varies merely in accordance with their activity. With some of the large steel works the case is different. In normal times they buy none at all, while when they are particularly pressed to make large outputs they enter the merchant pig iron market, and thus their demand fluctuates within wider limits.

The production of gray iron and malleable castings has not increased in recent years as rapidly as has the consumption of steel. The steel works have made themselves more self-supporting in the matter of pig iron. A number of merchant blast furnaces have been built, not because the demand for merchant pig iron had definitely increased, but because Lake Superior ore interests were seeking a fresh outlet for their ore. From these causes it has resulted that the merchant blast furnace capacity of the country is in larger ratio to the normal demand for merchant pig iron than is the case with steel products.

In connection with the hopes entertained by merchant furnaces that certain steel interests will eventually become important buyers of pig iron, an interesting point is to be considered. In a long production campaign the steel departments are able to speed up almost steadily, breaking their tonnage records time after time. It is not so with the blast furnaces. In periods of depression they are put in good condition, and when they start on a production campaign they do better at the outset than later, when furnace after furnace must be blown out for relining. In a campaign running into a period of years, without any new construction, the steel interests are likely to consume more and more pig iron, but to produce less and less as the campaign advances, so that should the hopes of the merchant furnaces not be realized within the next few months it does not follow that they may not be realized at some later time.

A Ferromanganese Shortage

The possibility of a shortage of ferromanganese, often discussed in the past year, seems nearer now than at any time since the war began. With constantly decreasing supplies of manganese ores at advancing prices, the recent order of the British Government that all producers and consumers of the alloy put aside a three months' supply before exporting any more and maintain such a reserve during the war is not surprising. Compliance with it by the industries affected is an act of self-preservation. Statistics show that, while Russian ore supplies are unobtainable, shipments from India to Great Britain have been constantly dwindling until in May they were 75 per cent less than in May a year ago.

Since about half of the ferromanganese consumed by the steel industry of the United States comes from England, the situation here may become serious. Unless supplies of the ore and of the alloy are considerably more in England than there is reason to believe, little is likely to be re-

sed for use in this country for several months. statistical analysis of the situation given elsere in this issue shows that our manganese ore ports to July 1 this year are less than half of rmal and that our receipts of ferromanganese re nearly 60 per cent less than the average for e years. Compared with 1913, when our plants re operating to capacity, 20,630 tons per month s the apparent ferromanganese consumption to duce 31,300,000 tons of steel. Assuming our oduction for the last half of this year to be at 000,000 tons per year, at least 112,000 tons of alloy will be necessary to keep our plants sup- d. Since the Steel Corporation produces its own pplies, which are 50 per cent of the total, at least 000 tons will be necessary for other consumers. r imports to July 1 were not over 21,000 tons d those for the last half are quite sure to be less. mestic production outside of the leading interest, ile not negligible, can by no means supply the ficiency. Nor can the partial substitution of egeleisen solve the problem, and there is a limit the cutting down of manganese additions in el making. Unless some unexpected war devel- ment relieves the situation, or unless stocks in nd here are larger than appearances indicate, the ture is not reassuring as to supplies of this very ecessary factor in steel making.

Year of the European War

The past week has marked the termination of ssibly the most destructive twelve months in the tory of the world. It is appalling to consider e enormous destruction of life and property in e gigantic conflict in which the leading countries the Old World are engaged. The assertion so en made in recent times that wars henceforth uld be necessarily of short duration has been proved by the contest which is now raging. It entering on its second year and no safe pre- tion can be made as to its termination. The r will apparently go on until some of the lead- nations engaged reach the point of utter haustion.

It is of special interest at this time to review iefly the developments of the first year of the eat European war in respect to this country. It becomes us to rejoice over the misfortunes of e distracted citizens of other countries, but the in truth is that this unexpected outbreak of the eatest war the world has even seen has enor- ously benefited the United States. Our position w is the exact reverse of what it was a year ago. that time the business of this country, already iously depressed by domestic conditions, suffered eat damage from the financial disturbances pre- itated throughout the world by the beginning of e huge conflict. The sudden necessity for raising enormous amount of gold to meet balances due Europe involved a heavy strain on our resources d caused a gloomy view of the immediate future banking and business circles. This was inten- ed by the interruption to the ocean-carrying de through the withdrawal of vessels belonging the belligerent nations, and our export trade for ime was seriously checked. Foreign holders of our securities forced them on the market to such an extent that our stock exchanges were closed and for a long period it was difficult to determine what even the best stocks or bonds were worth.

The same cause, however, which paralyzed our trade brought about a recovery from the extreme depression into which we were plunged. A demand, small at first but steadily increasing, came from the warring countries in the latter months of 1914 eventually bringing about the greatest export movement this country has ever seen. From month to month our balance of trade increased until the financial condition of the United States became stronger than ever before experienced. The pressure for gold from other countries not only faded but they became our debtors to such an extent that sales of American securities were no longer feared and our stock exchanges resumed their normal operations.

It must be conceded that the extraordinarily heavy war demand for our products has been the great underlying cause of the change in this country from the depression of the fall of 1914 to the prosperous conditions which have prevailed since the opening of spring. The stimulus to activity in the machinery trade and in those branches of business manufacturing war supplies has spread to domestic trade and buyers are no longer hesitating to cover their requirements and to make up products for the future. The war has further helped the domestic situation by preventing the importation into this country of foreign products which by this time would have been coming here in increasing volume by reason of our low duties if there had been no such interruption.

This country has also benefited to a great extent by the diversion to our markets of buyers in neutral countries who are no longer able to supply their wants from European sources. This class of trade may be looked upon as partly temporary, but it would be remarkable indeed if a very considerable part of the business thus secured should not be permanently retained by our manufacturers and merchants.

Auditing the Power Output

In many factories using electric power insufficient attention is given to analyzing the distribution of energy after it leaves the plant or substation bus bars. Manufacturers are prone to economize in instruments for use on circuits running to different departments, often installing only the fuses and switches imperatively demanded by the insurance companies, and omitting all means of checking regularly the energy demands and consumptions of the feeders. Plant owners who have adopted the broader policy of providing an adequate instrumental layout and whose engineering staffs take care to keep the instruments in good condition and to use them freely find that the investment is an exceedingly good one. In no other way can a close check be so well kept upon the power demands of machinery in groups and in sections.

The most useful permanent instrument for industrial power circuits is the watt-hour meter, although for special investigations a curve-drawing meter reading in kilowatts is almost invaluable. In

very large plants using a great number of high-powered tools with an extremely variable power demand, the manufacturer can go as far as he likes in the profitable equipment of individual machine-tool circuits with curve-drawing instruments; but for the ordinary establishment an integrating wattmeter on each important circuit gives ample information, provided the switchboard includes facilities for inserting an ammeter in any feeder circuit when a test is desired. In shops supplied from an alternating current distribution system a frequency meter is worth having, since the speed is closely dependent upon the maintenance of normal frequency, and in the regulation of hydroelectric transmission systems probably more attention is paid to keeping the frequency close to standard than to the maintenance of line voltage. On a 60-cycle system a power purchaser would be entirely justified in telephoning to the electric service company if the frequency fell off by even one cycle and remained low for more than a few moments, so important is speed in the maintenance of production rates to-day.

With watt-hour meters on local feeders read hourly or half-hourly and calibrated at least once a year, slight departures in power consumption among different departments may be quickly compared with the production record, and a good many times abnormal mechanical conditions may be found in this way before they have time to become sufficiently aggravated to run up a heavy cost account. The installation of an ammeter in each power and lighting circuit is well worth while where the cost of a recording instrument looms large upon the requisition, but for all-around service an ammeter with interchangeable connections, combined with recording meters for the various feeders, is sufficient. An indicating voltmeter is another desirable instrument, although approximate indications of the voltage conditions are afforded by local lighting appliances. Too often factory instruments are left unchecked from year to year, and unless the calibration of these is regularly maintained, the money expended upon them comes near being wasted. Properly cared for, such instruments are among the most useful aids to scientific management.

Scarcity of Magnesite

Magnesite has become practically unobtainable and producers of magnesite brick have virtually withdrawn from the market. Before the war the best grades were selling at about $20 per ton, but the last sale is reported to have been made at $65. Operators of basic open-hearth furnaces, in the making of the bottoms of which magnesite has been largely used, are now successfully substituting dolomite. When this is double burned, to thoroughly degasify it, it is found to be a reasonably satisfactory substitute for magnesite. One difficulty in using it is its tendency to slake if the furnace is shut down for a short period.

The property of the United States Metal Products Company, which was sold at auction Aug. 2 at 32 Liberty Street, New York, under the direction of John J. Townsend, referee in bankruptcy, realized $216,027. The creditors' committee paid $204,000 for most of the property and the part going to outsiders brought $12,027. The real estate and buildings at College Point, Long Island, brought $40,000.

Inland Steel Makes Good Showing

The report of the Inland Steel Company for th year ended June 30 shows an increase in net earnin of $403,902 and a balance available for dividend amounting to $1,396,784, compared with $1,108,198 year ago. This equals 14.09 per cent on the $9,909,6 stock outstanding as compared with 14.05 per cent th preceding year, when there was only $7,910,242 stoc in the hands of the public. The shares have been pu back on the previous dividend rate of 8 per cent b the declaration of a 2 per cent dividend for the se ond quarter. The income account is as follows:

	1915	1914
Net earnings	$2,041,248	$1,637,2
Other income	40,310	40,9
Total income	$2,081,558	$1,677,6
Depreciation, etc.	327,384	249,0
Net profits	$1,754,174	$1,428,6
Interest	357,390	320,4
Balance	$1,396,784	$1,108,1
Dividends	440,491	552,9
Surplus	$956,293	$550,2
Previous surplus	5,295,020	4,786,4
Less discount on mortgage	32,170	41,6
Stock dividend	1,993,331	
Total surplus	$4,225,812	$5,295,0

*After deducting charges for maintenance and repairs plants of $1,129,802 compared with $1,135,593 in 1914.

The balance sheet shows the following:

Assets

	1915	1914
Land, plants, etc.	$17,261,797	$15,987,2
Inventories	3,139,360	2,839,6
Bills receivable	177,264	84,2
Accounts receivable	1,591,895	1,541,2
Insurance unexpired	9,146	10,2
Cash	847,983	578,2
Deferred charges	15,767	34,8
Total assets	$23,043,212	$21,075,5

Liabilities

Capital stock	$9,909,681	$7,910,2
Bonded debt	6,410,000	5,600,0
Current accounts payable	732,389	774,2
Current payrolls	174,943	188,6
Special deposits	.....	70,2
Taxes accrued	130,179	58,8
Interest accrued	29,250	31,2
Reserves	1,430,968	1,146,2
Surplus	4,225,812	5,295,0
Total liabilities	$23,043,212	$21,075,5

Large Export Sales of Ferrosilicon

The Globe Iron Company, Jackson, Ohio, has ma large sales of Bessemer ferrosilicon for export, s negotiations are under way for additional quantiti These foreign orders call for the higher silicons, ru ning from 14 to 16 per cent. Such grades are extrem hard to produce in blast furnace practice and, in general way, are made only by chance or in an occ sional cast. The Globe Iron Company, however, pr duces these grades steadily, one cast after another, f weeks, thus demonstrating its ability to make iron this quality as a regular product. Globe ferrosilic both Bessemer and silvery grades, has now been wit drawn from the market.

The Western Kieley Steam Specialty Company, L to 122 West Illinois Street, Chicago, has been mu annoyed by the use of the Kieley name by other parti selling steam specialties. It therefore brought suit a has been awarded a decision restraining others fro using the name "Kieley Specialty Company" or a other name or style which includes the name "Kiele and the word "specialty" in any combination whatev The company was incorporated over seventeen yea ago, and is doing business all over the country.

The Endicott Forging & Mfg. Company, manufa turer of drop forgings, Endicott, N. Y., has elected th following officers: President and treasurer, S. J. Ma shall, Syracuse, N. Y.; vice-president, William Stone, Binghamton, N. Y.; secretary, Thomas A. Ma Clary, Union, N. Y.

"TRAP" CAR SERVICE

The Commerce Commission Cancels Charges for Less Than Carloads

WASHINGTON, D. C., August 2, 1915.—In a sweeping decision affecting tariffs covering trunk line, central freight association, Western trunk line, trans-Missouri and Southwestern territories, the Interstate Commerce Commission has ordered the cancellation of proposed charges for "trap" or "ferry" car service. These technical terms are applied to a car "placed at an industry or commercial house having a private siding, and there loaded by a shipper with less-than-carload shipments, and hauled by a carrier to its local freight or transfer station for handling and forwarding of contents; and also are applied to a car loaded with less-than-carload shipments which is hauled to and placed upon the private track of an industry or commercial house by the carrier from a local freight or transfer station." Where such cars are loaded to a prescribed minimum, the practice of the carriers has been to make no charge for the service. The proposed charges, in trunk line territory, except Buffalo, N. Y., and points taking Buffalo rates, and Pittsburgh, Pa., are 2 cents per 100 lb., minimum $2 per car; in central freight association territory, including Buffalo and Pittsburgh, 4 cents per 100 lb., minimum $4 per car, with a graduated scale of minimum charges for cars of less than 10,000 lb. loading; and in the territory west of the Mississippi River, including Western trunk line, trans-Missouri and Southwestern territories, 4 cents per 100 lb., minimum $4 per car.

Few tariffs filed as the result of joint action by the principal carriers have evoked so many protests as those involving trap charges, the most important and active protestants including the Carnegie Steel Company, Jones & Laughlin Steel Company, Pittsburgh Steel Company, Cambria Steel Company, Pressed Steel Car Company, Trumbull Steel Company, Alan Wood Iron & Steel Company, Laclede Steel Company, Detroit Steel Products Company, Pittsburgh Valve & Fittings Company, General Electric Company, General Motors Company, United States Radiator Corporation, Lake Erie Iron Company, Upson Nut Company, Massillon Rolling Mill Company, Standard Welding Company, Republic Stamping & Enameling Company, National Enameling & Stamping Company, the Sheet Metal Club and various iron and steel companies in the Mahoning and Shenango valleys.

In ruling upon this case the commission differentiates it carefully from the recent controversy concerning the legality of charges for car spotting, which were disallowed. The car spotting rules of the carriers applied only to carload shipments and the commission concedes that the trap service, which applies to less-than-carload shipments, embraces certain equities due the carriers which should receive consideration and which, under certain circumstances, may justify charges which it is intimated may be allowed if presented in carefully revised tariffs, excluding all charges for standard trap service.

PRIVATE SIDING ADDS TO THE CARRIER'S TERMINAL FACILITIES

Carriers throughout the country have considered, and now consider, their terminals in cities as units for rate-making purposes. Many of the sidetracks of industries are used by carriers as substitutes for adequate freight terminals. The tracks and loading facilities furnished by shippers relieve the carriers' freight stations, necessitating less outlay for expensive terminals in crowded cities, and in other ways aid in the expeditious and economical handling of traffic which the carriers' facilities are not adequate to handle. Carriers assert, and it is generally recognized, that higher charges are imposed for transportation of less-than-carload shipments than for carload shipments of the same commodities, because the former are loaded and unloaded by the carriers, and because the former entail more terminal and office expense upon the carrier. Should not, the commission asks, some consideration be given a shipper who loads and unloads his less-than-carload shipments and furnishes a terminal to the carrier besides?

If, on the other hand, a consignor orders a car placed on his private track, and he there loads it with less-than-carload shipments, and then orders the carrier to transport the car to its local freight or transfer station for rehandling and forwarding of contents, the consignor has used the facilities of the carrier to dray his shipments. The carrier has rendered a service which is special in character and for which it would seem to be entitled to fair compensation, with due regard to the service rendered.

More than 130 schedules of individual carriers are involved in this proceeding and the commission holds that if they were permitted to become effective many inequalities and discriminations of existing tariffs would be increased and new discriminations of like character would be multiplied. Under the circumstances, the commission finds that the carriers have failed to justify the charges proposed for trap-car service and the tariffs are therefore ordered canceled. It is assumed that new tariffs providing moderate charges for special service will be promptly filed.

W. L. C.

CONTENTS

A GAIN OF 16 FURNACES

July Pig-Iron Output 2,563,420 Tons

Steel Companies Close to Maximum Capacity—Present Rate of Output for the Country 32,000,000 Tons a Year

The operation of all the large steel plants of the country at nearly full capacity compelled the wheeling into line last month of all the available blast furnaces of such producers. Pig-iron production for July mounted to 2,563,420 gross tons, or 82,691 tons a day, against 2,380,827 in June, or 79,361 tons a day. Steel works furnaces made even a greater gain, as merchant production, owing to the poor working of a number of furnaces and the blowing out of a few others, fell off 500 tons a day. The steel companies made 62,895 tons of pig iron a day last month, against 59,022 tons in June, a gain of almost 3900 tons a day. In only four previous months—January, February, April and May, 1913—was the production of steel works blast furnaces at a greater rate than last month's. On Aug. 1, with 234 furnaces in blast, the active capacity was 86,776 tons a day, against 80,411 tons a day for 218 furnaces on July 1, so that pig-iron production, estimating charcoal iron, is now at the rate of nearly 32,000,000 tons a year. The greatest calendar year's output was 31,300,874 tons in 1913.

DAILY RATE OF PRODUCTION

The daily rate of production of coke and anthracite pig iron by months, from July, 1914, is as follows:

Daily Rate of Pig-Iron Production by Months—Gross Tons

	Steel works	Merchant	Total
July, 1914	45,027	18,123	63,150
August	46,937	17,426	64,363
September	46,344	16,409	62,753
October	41,026	16,335	57,361
November	35,305	15,306	50,611
December	33,381	15,515	48,896
January, 1915	35,998	15,661	51,659
February	44,192	15,621	59,813
March	50,036	16,539	66,575
April	52,804	17,746	70,550
May	54,655	18,360	73,015
June	59,022	20,339	79,361
July	62,895	19,796	82,691

OUTPUT BY DISTRICTS

The accompanying table gives the production of all coke and anthracite furnaces in July and the three months preceding:

Monthly Pig-Iron Production—Gross Tons

	Apr. (30 days)	May (31 days)	June (30 days)	July (31 days)
New York	156,449	176,423	172,193	178,5
New Jersey	6,592	6,600	6,240	5,8
Lehigh Valley	63,679	64,796	64,353	76,6
Schuylkill Valley	50,356	51,743	53,142	49,3
Lower Susquehanna and Lebanon Valley	32,581	28,001	28,116	34,4
Pittsburgh district	497,890	538,654	595,207	668,5
Shenango Valley	101,172	121,910	124,941	134,7
Western Pennsylvania	132,849	139,247	156,350	160,2
Maryland, Virginia and Kentucky	38,860	45,593	43,395	38,4
Wheeling district	84,700	83,400	93,991	100,5
Mahoning Valley	281,742	310,234	299,644	295,8
Central and Northern Ohio	162,448	165,882	175,376	196,8
Hocking Valley and Hanging Rock	19,985	15,149	22,135	23,3
Chicago district	269,259	292,891	307,554	322,9
Mich., Minn., Mo., Wis. and Col.	63,712	60,789	66,168	71,8
Alabama	139,457	146,502	158,569	165,4
Tennessee	14,763	15,656	14,353	14,8
Total	2,116,494	2,263,470	2,380,827	2,563,4

PRODUCTION OF STEEL COMPANIES

Returns from all furnaces of the United States Steel Corporation and the various independent steel companies show the following totals of product month by month. Only steel-making iron is included in the figures below, together with ferromanganese and spiegeleisen. These last, while stated separately, are also included in the columns of "total production."

Production of Steel Companies—Gross Tons

	Pig, total production			Spiegeleisen and ferromanganese		
	1913	1914	1915	1913	1914	1915
Jan.	1,981,560	1,261,430	1,115,944	15,633	17,325	13,9
Feb.	1,792,154	1,329,414	1,237,380	20,131	10,524	13,2
Mar.	1,904,878	1,704,688	1,551,082	20,546	20,133	12,2
Apr.	1,939,751	1,635,226	1,584,111	23,108	18,676	12,3
May	1,991,192	1,457,847	1,694,290	19,042	21,504	13,4
June	1,860,070	1,329,623	1,770,657	19,212	16,254	19,5
July	1,840,216	1,395,851	1,949,750	28,310	16,524	17,5
Aug.	1,833,352	1,455,054	.....	20,680	11,577	.....
Sept.	1,828,232	1,390,322	.....	24,555	13,786	.....
Oct.	1,848,634	1,271,820	.....	19,499	17,435	.....
Nov.	1,573,007	1,059,159	.....	26,765	21,977	.....
Dec.	1,298,262	1,034,802	.....	14,095	20,733	.....

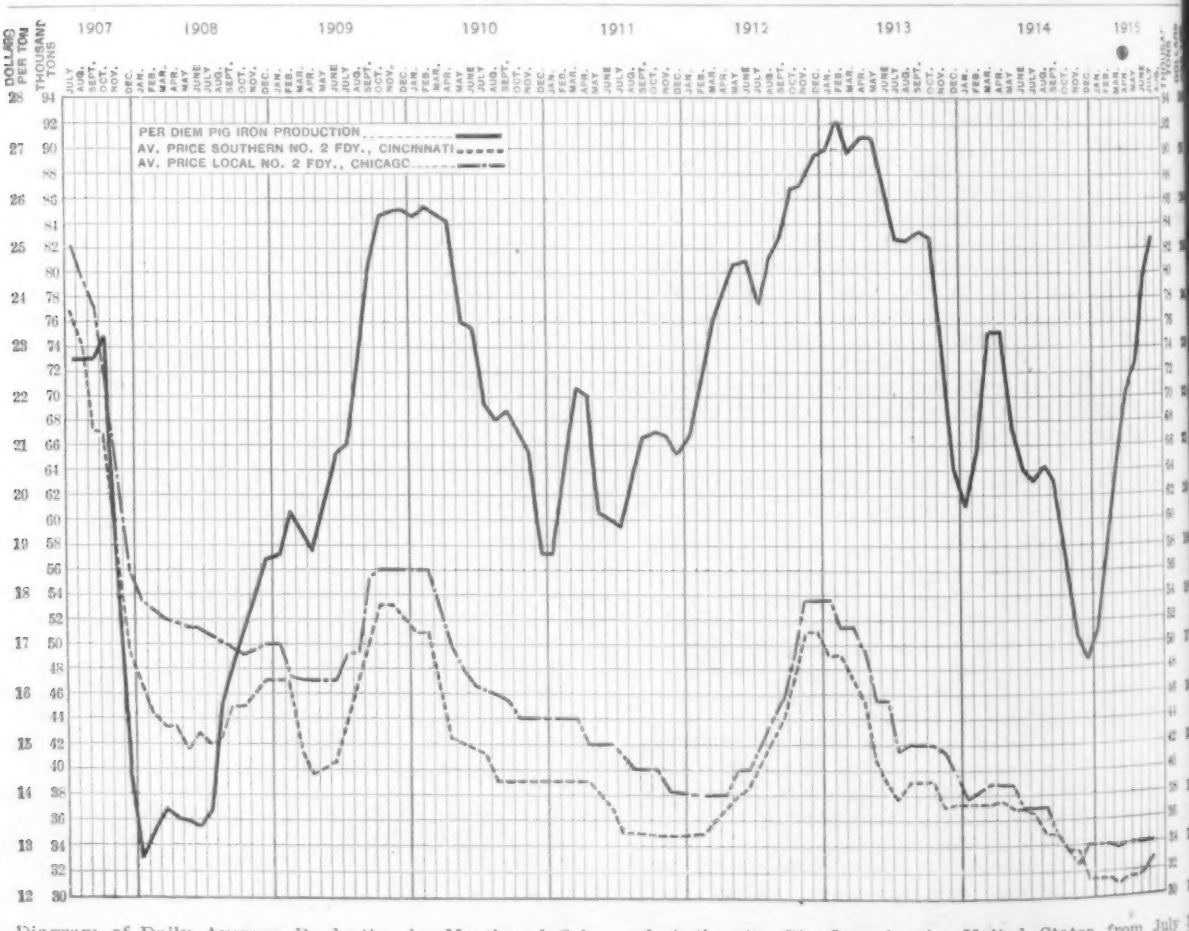

Diagram of Daily Average Production by Months of Coke and Anthracite Pig Iron in the United States from July 1, 1907, to Aug. 1, 1915; Also of Monthly Average Prices of Southern No. 2 Foundry Iron at Cincinnati and Local No. 2 Foundry Iron at Chicago District Furnace

CAPACITY IN BLAST AUG. 1 AND JULY 1

The following table shows the daily capacity in gross tons of furnaces in blast Aug. 1 and July 1 by districts:

Coke and Anthracite Furnaces in Blast

Location of furnaces	Total number of stacks	Aug. 1 Number in blast	Aug. 1 Capacity per day	July 1 Number in blast	July 1 Capacity per day
New York:					
Buffalo	19	16	5,870	14	5,316
Other New York	7	2	416	2	424
New Jersey	7	1	192	1	208
Pennsylvania:					
Lehigh Valley	22	8	2,261	8	2,169
Spiegel	2	2	211	2	209
Schuylkill Val.	15	7	2,015	6	1,821
Lower Susquehanna	7	2	535	2	524
Lebanon Valley	10	2	446	2	428
Pittsburgh Dist.	52	48	22,132	44	20,466
Ferro	4	2	223	2	185
Shenango Val.	19	11	4,347	11	4,425
Western Penn.	24	15	5,075	16	5,087
Spiegel	1	1	130	1	130
Maryland	3	1	490	1	515
Ferro	1	1	75	1	51
Wheeling Dist.	11	10	3,580	8	2,966
Ohio:					
Mahoning Val.	25	21	9,538	21	9,605
Central and Northern	24	17	7,135	14	5,846
Hocking Val. & Hang. Rock.	15	5	725	5	738
Ill. and Ind.	34	24	11,840	21	10,520
Ferro	2	1	120	1	123
Michigan, Wis. & Minn.	10	6	1,650	6	1,581
Col. and Mo.	7	2	650	2	645
The South:					
Virginia	24	4	610	5	695
Kentucky	5	1	275	1	220
Alabama	46	20	5,760	17	5,036
Tennessee	20	4	475	4	478
Total	416	234	86,776	218	80,411

The furnaces blown in last month include two Lackawanna in New York; one Swede, one Warwick and one Worth in the Schuylkill Valley; one Isabella, one Lucy, one Aliquippa, and one Eliza in the Pittsburgh district; two National Tube in the Wheeling district; one Central, one Cleveland, and one National Tube in Ohio; three South Chicago in the Chicago district, and one Sloss, one Ensley and Oxmoor in Alabama.

Among the furnaces blown out in July were one Swede and one Worth in the Schuylkill Valley, Colonial in western Pennsylvania, Oriskany in Virginia, and Norton in Kentucky.

DIAGRAM OF PIG-IRON PRODUCTION AND PRICES

The fluctuations in pig-iron production from July, 1907, to the present time are shown in the accompanying chart. The figures represented by the heavy lines are those of daily average production, by months, of coke and anthracite iron. The two other curves on the chart represent monthly average prices of Southern No. 2 foundry pig iron at Cincinnati and of local No. 2 foundry iron at furnace at Chicago. They are based on the weekly market quotations of THE IRON AGE. The figures for daily average production, beginning January, 1908, are as follows:

Daily Average Production of Coke and Anthracite Pig Iron in the United States by Months Since Jan. 1, 1908—Gross Tons

	1908	1909	1910	1911	1912	1913	1914	1915
Jan.	33,918	57,975	84,148	56,752	66,384	90,172	60,808	51,659
Feb.	37,163	60,976	85,616	64,090	72,442	92,369	67,453	59,813
Mar.	39,619	59,232	84,459	70,036	77,591	89,147	75,738	66,575
Apr.	38,289	57,962	82,792	68,836	79,181	91,759	75,665	70,550
May	37,603	60,753	77,102	61,079	81,051	91,039	67,506	73,015
June	36,444	64,656	75,516	59,585	81,358	87,619	63,916	79,361
July	39,287	67,793	69,305	57,841	77,738	82,601	63,150	82,691
Aug.	42,851	72,546	67,963	62,150	81,046	82,057	64,363	.....
Sept.	47,300	79,507	68,476	65,903	82,128	83,531	62,753	.....
Oct.	50,554	83,856	67,520	67,811	86,722	82,133	57,361	.....
Nov.	51,595	84,917	63,659	66,648	87,697	74,453	50,611	.....
Dec.	56,158	85,022	57,349	65,912	89,766	63,987	48,896	.....

THE RECORD OF PRODUCTION

Production of Coke and Anthracite Pig Iron in the United States by Months Since Jan. 1, 1911—Gross Tons

	1911	1912	1913	1914	1915
Jan.	1,759,326	2,057,911	2,795,331	1,885,054	1,601,421
Feb.	1,794,509	2,100,815	2,586,337	1,888,670	1,674,771
Mar.	2,171,111	2,405,318	2,763,563	2,347,867	2,063,834
Apr.	2,064,086	2,375,436	2,752,761	2,269,955	2,116,494
May	1,893,456	2,512,582	2,822,217	2,092,686	2,263,470
June	1,787,566	2,440,745	2,628,565	1,917,783	2,380,827
July	1,793,068	2,410,889	2,560,646	1,957,645	2,563,420
Aug.	1,926,637	2,512,431	2,545,763	1,995,261	.....
Sept.	1,997,102	2,463,839	2,505,927	1,882,577	.....
Oct.	2,102,147	2,689,933	2,546,261	1,778,186	.....
Nov.	1,999,423	2,630,854	2,233,123	1,518,316	.....
Dec.	2,043,270	2,782,737	1,983,607	1,515,752	.....

Blast Furnace Notes

The Pennsylvania Steel Company expects to blow in within the next week its No. 4 furnace at Steelton, Pa. Work on the new No. 5 furnace, which will have 500 tons daily capacity, is nearly completed and it will probably be put in operation within a month. When the No. 5 furnace is blown in No. 3 will be blown out and will be reconstructed to bring it up to 500 tons capacity.

The Thomas Iron Company has begun tearing down its No. 2 and No. 4 blast furnaces at Hokendauqua, Pa. Both were abandoned some years ago. On July 15 the No. 8 furnace of the company at Albertis, Pa., made 75 tons of pig iron, which is its largest output. It was built in 1868.

No. 4 blast furnace of the Shenango Furnace Company, Sharpsville, Pa., is being relined and repaired and will start late this month. All three stacks of this company will then be in blast, two on basic iron and one on Bessemer. The Bessemer iron goes to the Valley Mold & Foundry Company at Sharpsville, to be made into ingot molds. The Shenango Furnace Company will also start its coke works at Wilpen, Pa., to make coke for No. 4 furnace.

Worth Brothers Company, Coatesville, Pa., blew out its No. 2 furnace July 23 for repairs and blew in its No. 1 furnace, which had been long inactive, on July 26.

M. A. Hanna & Co. are relining Fannie furnace at West Middlesex, Pa., which has been out of blast about eighteen months. This work is being done at the present time with a view to possibly blowing the furnace in late in the year.

All the seven furnaces of the Lackawanna Steel Company are now in operation, two having been blown in in July.

Mattie furnace of the Girard Iron Company, Girard, Ohio, was made ready for blowing in this week.

Steel Foundry Activity at Chester, Pa.

Steel foundry operations in the Chester, Pa., district present a decided contrast to those of the winter and early spring. The five large open-hearth plants and the one converter foundry are averaging 90 per cent of capacity. One large open-hearth plant is working nearly full, and its production in July was said to be more than the total of the three previous months. While the shipyards have been an important factor in this revival, several of the plants having large contracts for battleship and merchant ship work, the recent orders taken by locomotive builders for 400 Russian, Pennsylvania Railroad and other locomotives, as well as the insistent demands from machine tool builders, are the main causes of the present activity. The outlook for the future is reported to be excellent.

Supplies of ferromanganese are said to be sufficient until the first of the year. Realizing the present value of this important alloy, of which more is used in steel castings than in the average rolled steel, foundry managers are conserving its use all possible. Some attempts have been made to use spiegeleisen as a partial substitute but without much success thus far. The uncertain results in steel foundry practice are a deterring factor.

It is announced at Chester that A. R. Brunker & Co., Philadelphia, have purchased the plant of the Keystone Steel Casting Company, Chester, and will operate it. This plant has been idle for about two years, and was turning out both crucible and open-hearth castings, the open-hearth furnace being of 2 tons capacity.

Another By-Product Coke Plant

Corrigan, McKinney & Co., Cleveland, Ohio, will erect a by-product coke plant with a daily capacity of about 2000 tons. This will supply coke for the firm's two blast furnaces in Cleveland, for another furnace now under construction and for a fourth furnace to be built at the completion of the third stack. Contracts for the ovens will be placed this week.

The Iron and Metal Markets

PIG-IRON MARKET BUOYANT

Greater Activity at Advancing Prices

A Further Gain in Output—Steel Works Furnaces Close to Maximum

Pig iron, after being in a rut for months, while steel has been active at advancing prices, has started in the past week on what promises to be an important movement. Prices in nearly all districts are up 50 cents and the sudden appearance of inquiry from many sources indicates an effort of consumers to forestall a long-delayed rise.

The southern Ohio market has been particularly active. Sales of basic iron at Cincinnati were above 100,000 tons in July, including 40,000 tons to a large sheet interest, and two inquiries are pending, one for 18,000 and the other for 10,000 tons. In foundry iron, Cincinnati sales have been at higher prices, most sellers of Southern iron now asking $10.50, Birmingham, for No. 2. New York and Chicago pig-iron markets have also broadened and the advancing tendency is more pronounced. At St. Louis a round tonnage of basic iron is under inquiry and an Indiana wire plant is asking for 10,000 tons.

To an increasing extent foundry-iron buyers are inquiring for 1916 iron. Most furnaces are staving off such distant deliveries, but some have quoted $1 a ton advance for first-quarter iron, as represented by $14 at Buffalo furnace. Generally producers' ideas of the advances that will come before next year are much less modest.

Pig-iron output is crowding close up to high-record figures, but all because of the prodigious demand for steel. In July the merchant furnaces, due to the poor working of some and the blowing out of several, made less iron than in June. Most of the furnaces now out will require higher prices to bring them into action.

The country's July pig-iron production was 2,563,420 tons or 82,691 tons a day, against 2,380,827 tons in June, or 79,361 tons a day. The steel companies are now close to their maximum pig-iron capacity. They made 62,895 tons a day in July, or 3900 tons more than the daily average in June. In only four previous months—January, February, April and May, 1913—was the production of steel-works furnaces greater than last month's.

Sixteen more furnaces were in blast on Aug. 1 than on July 1—a total of 234 with a daily capacity of 86,776 tons against 218 furnaces and 80,411 tons a day. Thus production to-day is at the rate of 32,000,000 tons a year, against 18,000,000 tons Jan. 1. The greatest year's total was 31,300,000 tons in 1913.

In steel products the week has been quieter. Most domestic consumers are apparently covered for several months and there is little or no protective buying. But the action of the billet market, particularly in the East, is not viewed with equanimity. At $30 and higher in eastern Pennsylvania for rolling billets, semi-finished steel is above the level of some finished products.

The bewildering feature of the Eastern billet market is the rapid advance in the past three weeks from $21, at which some recent purchases were made by the Steel Corporation. Yet billet sellers have little steel to sell for this year, and in the Central West the shortage in open-hearth steel grows more acute.

At the same time bars for war purposes have sold up to 2.5c. to 3c. Various new inquiries for rounds have come up, including one for 16,000 tons of forging rounds at Cleveland.

The week's export trade apart from war buying has been only moderately active. Price advances have raised some questions. Yet with steel production expanding each week and home requirements increasing, the export market is dominated by the fact that the United States alone is able to supply the needs of neutral nations.

The 1.30c., Pittsburgh, level for bars, plates and shapes is coming to be fixed by virtue of the open-hearth steel situation, but with no stronger demand developing for either plates or structural steel. Eastern shipyards have taken contracts for five more vessels—four for the Standard Oil Company—and a total of 18,000 tons of steel will be required.

A Comparison of Prices

Advances Over the Previous Week in Heavy Type, Declines in Italics

At date, one week, one month and one year previous

Pig Iron, Per Gross Ton:	Aug. 4, 1915.	July 28, 1915.	July 7, 1915.	Aug. 5, 1914.
No. 2 X, Philadelphia...	$14.50	$14.50	$14.25	$14.75
No. 2, Valley furnace....	12.75	12.75	12.75	13.00
No. 2 Southern, Cin'ti..	**13.15**	12.90	12.65	13.25
No. 2, Birmingham, Ala.	**10.25**	10.00	9.75	10.00
No. 2, furnace, Chicago*	**13.50**	13.00	13.00	13.75
Basic, del'd, eastern Pa..	14.00	14.00	13.75	14.00
Basic, Valley furnace....	13.00	13.00	12.65	13.00
Bessemer, Pittsburgh....	15.20	15.20	14.70	14.90
Malleable Bess., Ch'go*...	**13.50**	13.00	13.00	14.00
Gray forge, Pittsburgh..	13.45	13.45	13.45	13.65
L. S. charcoal, Chicago..	15.75	15.75	15.75	15.75
Billets, etc. Per Gross Ton:				
Bess. billets, Pittsburgh..	**22.50**	22.00	20.50	19.50
O.-h. billets, Pittsburgh.	**22.50**	22.00	21.50	19.50
O.-h. sheet bars, P'gh....	**23.50**	23.00	22.00	20.50
Forging billets, P'gh....	28.00	28.00	27.00	25.00
O.-h. billets, Phila.....	30.00	30.00	24.56	21.90
Wire rods, Pittsburgh...	26.00	26.00	25.50	24.50
Finished Iron and Steel, Per Lb. to Large Buyers:	Cents.	Cents.	Cents.	Cents.
Bess, rails, heavy, at mill	1.25	1.25	1.25	1.25
Iron bars, Philadelphia..	**1.35**	1.30	1.22½	1.17½
Iron bars, Pittsburgh....	1.25	1.25	1.25	1.15
Iron bars, Chicago.....	1.20	1.20	1.20	1.07½
Steel bars, Pittsburgh...	**1.30**	1.25	1.25	1.15
Steel bars, New York....	1.469	1.469	1.419	1.31
Tank plates, Pittsburgh..	1.25	1.25	1.20	1.10
Tank plates, New York..	**1.419**	1.369	1.369	1.26
Beams, etc., Pittsburgh..	**1.30**	1.25	1.25	1.15
Beams, etc., New York..	**1.469**	1.419	1.419	1.26
Skelp, grooved steel, P'gh	1.25	1.25	1.15	1.15
Skelp, sheared steel, P'gh	1.30	1.30	1.20	1.20
Steel hoops, Pittsburgh..	1.30	1.30	1.30	1.30

*The average switching charge for delivery to foundries in the Chicago district is 50c. per ton.

Sheets, Nails and Wire, Buyers:	Aug. 4, 1915. Cents.	July 28, 1915. Cents.	July 7, 1915. Cents.	Aug. 5, 1914. Cents.
Per Lb. to Large Buyers:				
Sheets, black, No. 28, P'gh.	**1.80**	1.75	1.75	1.80
Sheets, black, No. 28, P'gh	4.00	4.00	4.50	2.75
Galv. sheets, No. 28, P'burgh...	1.60	1.60	1.60	1.55
Wire nails, P'burgh	1.55	1.55	1.55	1.55
Cut nails, P'burgh	1.40	1.40	1.40	1.35
Fence wire, base, P'gh...	2.50	2.50	2.50	1.95
Barb wire, galv., P'gh...				
Coke, Connellsville,				
Per Net Ton at Oven:				
Furnace coke, prompt....	*$1.50*	$1.60	$1.75	$1.70
Furnace coke, future....	1.75	1.75	1.75	1.85
Foundry coke, prompt...	2.00	2.00	2.00	2.25
Foundry coke, future....	2.25	2.25	2.25	2.35
Metals.				
Per Lb. to Large Buyers:	Cents.	Cents.	Cents.	Cents.
Lake copper, New York..	*21.00*	22.00	22.50	12.87½
Electrolytic copper, N. Y.	*18.25*	18.50	19.75	12.50
Spelter, St. Louis.....	*17.25*	18.00	21.50	4.85
Spelter, New York.....	*17.50*	18.25	22.00	5.00
Lead, St. Louis.....	*4.90*	5.45	5.62½	3.72½
Lead, New York.....	*5.00*	5.50	5.75	3.90
Tin, New York.....	*35.50*	36.00	39.25	57.00
Antimony, Asiatic, N. Y..	*34.50*	35.50	36.75	7.00
Tin plate, 100-lb. box, P'gh	$3.10	$3.10	$3.10	$3.25
Old Material. Per Gross Ton:				
Iron rails, Chicago.....	12.25	12.25	12.25	12.00
Iron rails, Philadelphia..	15.50	15.50	15.00	14.00
Carwheels, Chicago	11.50	11.50	11.00	11.25
Carwheels, Philadelphia.	**12.75**	12.50	12.00	11.00
Heavy steel scrap, P'gh..	**13.25**	13.00	11.75	11.50
Heavy steel scrap, Phila.	**13.00**	12.50	11.50	9.75
Heavy steel scrap, Ch'go	11.25	11.25	10.25	9.75
No. 1 cast, Pittsburgh...	12.00	12.00	12.25	11.50
No. 1 cast, Philadelphia.	12.50	12.50	12.25	12.00
No. 1 cast, Ch'go (net ton)	9.50	9.50	9.25	9.50

Finished Iron and Steel f. o. b. Pittsburgh

Freight rates from Pittsburgh in carloads, per 100 lb.: New York, 16.9c.; Philadelphia, 15.9c.; Boston, 18.9c.; Buffalo, 11.6c.; Cleveland, 10.5c.; Cincinnati, 15.8c.; Indianapolis, 17.9c.; Chicago, 18.9c.; St. Louis, 20.6c.; Kansas City, 43.6c.; Omaha, 43.6c.; St. Paul, 32.9c.; Denver, 68.6c.; New Orleans, 30c.; Birmingham, Ala., 45c.; Pacific coast, 80c. on plates, structural shapes and sheets No. 11 and heavier; 85c. on sheets Nos. 12 to 16; 95c. on sheets No. 16 and lighter; 65c. on wrought pipe and boiler tubes. The foregoing rates to the Pacific coast are by rail. The rate via New York and the Panama Canal has no stability, being dependent on vessel charges.

Plates.—Tank plates, ¼ in. thick, 6¼ in. up to 100 in. wide, 1.25c. base net cash, 30 days. Following are stipulations prescribed by manufacturers:

Rectangular plates, tank steel or conforming to manufacturers' standard specifications for structural steel dated Feb. 6, 1903, or equivalent, ¼ in. and over on thinnest edge, 100 in. wide and under, down to but not including 6 in. wide, are base.

Plates up to 72 in. wide, inclusive, ordered 10.2 lb. per sq. ft., are considered ¼-in. plates. Plates over 72 in. wide must be ordered ¼ in. thick on edge or not less than 11 lb. per sq. ft., to take base price. Plates over 72 in. wide ordered less than 11 lb. per sq. ft. down to the weight of 3-16 in. take the price of 3-16 in.

Allowable overweight, whether plates are ordered to gage or weight to be governed by the standard specifications of the Association of American Steel Manufacturers.

Extras	Cents per lb.
Gages under ¼ in. to and including 3-16 in....	.10
Gages under 3-16 in. to and including No. 8....	.15
Gages under No. 8 to and including No. 9.....	.25
Gages under No. 9 to and including No. 10.....	.30
Gages under No. 10 to and including No. 12.....	.40
Sketches (including straight taper plates), 3 ft. and over	.10
Complete circles, 3 ft. in diameter and over....	.20
Boiler and flange steel	.10
"A. B. M. A." and ordinary firebox steel.....	.20
Still bottom steel	.30
Marine steel	.40
Locomotive firebox steel	.50
Widths over 100 in. up to 110 in., inclusive.....	.05
Widths over 110 in. up to 115 in., inclusive.....	.10
Widths over 115 in. up to 120 in., inclusive.....	.15
Widths over 120 in. up to 125 in., inclusive.....	.25
Widths over 125 in. up to 130 in., inclusive.....	.50
Widths over 130 in.	1.00
Cutting to lengths under 3 ft. to 2 ft., inclusive.	.25
Cutting to lengths under 2 ft. to 1 ft., inclusive.	.50
Cutting to lengths under 1 ft.	1.55

No charge for cutting rectangular plates to lengths 3 ft. and over.

Wire Products.—Prices to jobbers. Fence wire, Nos. 0 to 9, per 100 lb., terms 60 days or 2 per cent discount in 10 days, carload lots, annealed, $1.40; galvanized, $2.20. Galvanized barb wire and staples, $2.50; painted, $1.70. Wire nails, $1.60. Galvanized nails, 1 in. and longer, $1.75 advance over base price; shorter than 1 in., $2.25 advance over base price. Woven wire fencing, 69 per cent off list for carloads; 68 off for 1000-rod lots; 67 off for less than 1000-rod lots.

The following table gives the price to retail merchants on fence wire in less than carloads, with the extras added to the base price:

Plain Wire, per 100 lb.

Nos.	0 to 9	10	11	12&12½	13	14	15	16
Annealed	$1.55	$1.60	$1.65	$1.70	$1.80	$1.90	$2.00	$2.10
Galvanized	2.45	2.50	2.55	2.60	2.70	2.80	3.10	3.20

Wire Rods.—Bessemer, open-hearth and chain rods, $26.

Structural Material.—I-beams, 3 to 15 in.; channels, 3 to 15 in.; angles 3 to 6 in. on one or both legs, ¼ in. thick and over, and zees, 3 in. and over, 1.30c. Extras on other shapes and sizes are as follows:

	Cents per lb.
I-beams over 15 in.	.10
H-beams over 18 in.	.10
Angles over 6 in., on one or both legs.	.10
Angles, 3 in. on one or both legs less than ¼ in. thick, as per steel bar card, Sept. 1, 1909....	.70
Tees, structural sizes (except elevator, handrail, car truck and conductor rail)	.05
Channels and tees, under 3 in. wide, as per steel bar card, Sept. 1, 1909	.20 to .80
Deck beams and bulb angles	.30
Handrail tees	.75
Cutting to lengths under 3 ft., to 2 ft. inclusive.	.25
Cutting to lengths, under 2 ft. to 1 ft. inclusive.	.50
Cutting to lengths, under 1 ft.	1.55

No charge for cutting to lengths 3 ft. and over.

Wrought Pipe.—The following are the jobbers' carload discounts on the Pittsburgh basing card in effect from June 17, 1915, all full weight:

Butt Weld

Steel: Inches	Black	Galv.	Iron: Inches	Black	Galv.
⅛, ¼ and ⅜	72	40½	¼ and ¼	64	31
½	76	53½	⅜	64	31
¾ to 3	79	57½	½	68	41
			¾ to 2½	71	46

Lap Weld

2	76	54½	1¼	55	30
2½ to 6	78	56½	1½	66	41
7 to 12	76	54½	2	67	43
13 and 14	62½	..	2½ to 4	69	46
15	60	..	4½ to 6	69	46
			7 to 12	67	46

Reamed and Drifted

1 to 3, butt	77	55½	1 to 1½, butt	69	44
2, lap	74	52½	2, butt	69	44
2½ to 6, lap	76	54½	1¼, lap	53	28
			1½, lap	64	39
			2, lap	65	41
			2½ to 4, lap	67	44

Butt Weld, extra strong, plain ends

⅛, ¼ and ⅜	67	43½	⅜	61	37
½	72	52½	½	66	45
¾ to 1½	76	56½	¾ to 1½	70	47
2 to 3	77	57½	2 and 2½	71	48

Lap Weld, extra strong, plain ends

2	73	51½	1½	65	42
2½ to 4	75	53½	2	67	43
4½ to 6	74	52½	2½ to 4	69	46
7 to 8	68	46½	4½ to 6	68	45
9 to 12	63	41½	7 to 8	61	40
			9 to 12	56	35

Butt Weld, double extra strong, plain ends

½	62	42½	½	56	34
¾ to 1½	65	45½	¾ to 1½	59	37
2 to 2½	67	47½	2 and 2½	61	39

Lap Weld, double extra strong, plain ends

2	63	42½	2	57	34
2½ to 4	65	45½	2½ to 4	59	39
4½ to 6	64	44½	4½ to 6	58	38
7 to 8	58	36½	7 to 8	51	29

To the large jobbing trade an additional 5 per cent is allowed over the above discounts.

The above discounts are subject to the usual variation in weight of 5 per cent. Prices for less than carloads are two (2) points lower basing (higher price) than the above discounts on black and three (3) points on galvanized.

Boiler Tubes.—Discounts on less than carloads, f.o.b. Pittsburgh, freight to destination added, in effect from July 16, 1915.

Lap Welded Steel		*Standard Charcoal Iron*	
1¾ and 2 in.	63	1¾ and 2 in.	50
2¼ in.	60	2¼ in.	47
2½ to 2¾ in.	66	2½ and 2¾ in.	54
3 and 3¼ in.	71	3 and 3¼ in.	58
3½ and 4½ in.	72	3½ and 4½ in.	60
5 and 6 in.	65	5 and 6 in.	54
7 to 13 in.	62		

Locomotive and steamship special charcoal grades bring higher prices.

1¾ in., over 18 ft., 10 per cent net extra.

2 in. and larger, over 22 ft., 10 per cent net extra.

Sheets.—Makers' prices for mill shipment on sheets of U. S. Standard gage, in carload and larger lots, on which jobbers charge the usual advance for small lots

from store, are as follows, f.o.b. Pittsburgh, terms 30 days net, or 2 per cent cash discount in 10 days from date of invoice.

Blue Annealed Sheets

	Cents per lb.
Nos. 3 to 8	1.30 to 1.35
Nos. 9 to 10	1.35 to 1.40
Nos. 11 and 12	1.40 to 1.45
Nos. 13 and 14	1.50 to 1.55
Nos. 15 and 16	1.60 to 1.65

Box Annealed Sheets, Cold Rolled

	Cents per lb.
Nos. 10 and 11	1.45
No. 12	1.45
Nos. 13 and 14	1.50
Nos. 15 and 16	1.55
Nos. 17 to 21	1.60
Nos. 22 and 24	1.65
Nos. 25 and 26	1.70
No. 27	1.75
No. 28	1.80
No. 29	1.85
No. 30	1.95

Galvanized Sheets of Black Sheet Gage

	Cents per lb.
Nos. 10 and 11	3.00 to 3.50
No. 12	3.10 to 3.60
Nos. 13 and 14	3.10 to 3.60
Nos. 15 and 16	3.20 to 3.70
Nos. 17 to 21	3.35 to 3.85
Nos. 22 and 24	3.55 to 4.05
Nos. 25 and 26	3.70 to 4.20
No. 27	3.85 to 4.35
No. 28	4.00 to 4.50
No. 29	4.75
No. 30	5.00

Pittsburgh

PITTSBURGH, PA., Aug. 3, 1915.

The steel trade continues very active, operations being close to 100 per cent, except in Bessemer capacity, which is slightly less. The Edgar Thomson works of the Carnegie Steel Company is not running full, not having enough rolling capacity to take care of the Bessemer and open-hearth steel output. Prices are very strong and reports are that shrapnel steel bars sold here yesterday at 3.25c. per pound. The Pittsburgh Valve, Foundry & Construction Company of this city has inquiries out for considerable machinery for making shrapnel, but has not yet closed. Reports that the Garland Corporation, Pittsburgh, has taken a contract for $68,000,000 for munitions for Russia are not credited here. It is not equipped for making munitions, and if it did secure a contract would have to sublet it. The shortage in supply of open-hearth steel is getting more acute, and several consumers that failed to cover have recently paid premiums to get prompt deliveries. Prices on plates, shapes, and bars with local mills are firm at 1.30c., and quotations for last quarter of 1.35c. have been made. It is predicted that by Jan. 1 plates, shapes, and bars will be on a 1.40c. basis. The pig-iron market is fairly active and prices are firm, but no higher. Heavy melting steel scrap is up about 50c. per ton. Coke is dull and prices are easier, due to a surplus in supply.

Pig Iron.—The new demand is fair and prices are strong. W. P. Snyder & Co. report the average price of Bessemer iron in July to have been $13.991, an increase over June of 24.10c., while the average price of basic was $12.959, an increase over June of 23.5c. These prices are f.o.b. Valley furnace. An inquiry is out for 4000 tons of Bessemer iron for shipment to Italy. A Sharpsville furnace interest has just shipped 2000 tons of standard Bessemer to Italy, for which $14.25 at furnace was paid. The Westinghouse Electric & Mfg. Company has closed for about 4500 tons of foundry iron for Trafford City, and about 5500 tons for its Cleveland foundry. The Trafford City iron is reported to have gone on the basis of about $12.75, Valley furnace, for No. 2. Two small sales of standard Bessemer iron amounting to 1500 tons are reported at $14.25 at furnace. We quote: Standard Bessemer iron, $14.25; basic, $13; No. 2 foundry, $12.75 to $13, the lower price for prompt shipment; gray forge, $12.50 to $12.75, and malleable Bessemer, $13, all at Valley furnace, the freight rate for delivery in the Pittsburgh and Cleveland districts being 95c. a ton.

Billets and Sheet Bars.—Not much new inquiry is out for steel, but consumers are specifying freely. The Carnegie Steel Company and the Youngstown steel mills report they are considerably back in shipments. The Pittsburgh Steel Company is reported to have bought 15,000 tons of rod billets from an outside mill to help out on contracts. The price paid was not learned. Sheet bars for prompt delivery have sold at $23, Youngstown. Prices are very strong and we quote: Bessemer and open-hearth billets, $21.50 to $22, and Bessemer and open-hearth sheet bars, $22.50 to $23, Youngstown mills; Bessemer and open-hearth billets, $22.50, and Bessemer and open-hearth sheet bars, $23.50, f.o.b. Pittsburgh. Forging billets are $28 for sizes up to but not including 10 x 10 in., and for carbons up to 0.25, the regular extras being charged for larger sizes and higher carbons. Forging billets running above 0.25 and up to 0.60 carbon take $1 per ton extra. Axle billets are held at $24.

Ferroalloys.—Sales of carload lots of English 80 per cent ferromanganese are being made at about $100 to $102.50, Baltimore. The freight for delivery in the Pittsburgh district from Aug. 1 is $2.46 per ton. New York importers are quoting $88 to $90 on contracts, but give no assurance about deliveries. We quote 50 per cent ferrosilicon in lots up to 100 tons, at $73; over 100 tons to 699 tons, $72, and over 600 tons, $71, delivered in the Pittsburgh district. We quote 10 per cent Bessemer ferrosilicon at $17.50; 11 per cent, $18.50; 12 per cent, $19.50, all f.o.b. cars at furnace, Ashland, Ky., Jackson, or New Straitsville, Ohio, each of these points having a rate to Pittsburgh of $2 per gross ton. We quote 20 per cent spiegeleisen at $25 at furnace. We quote ferrotitanium at 8c. per lb. in carloads, 10c. in 2000-lb. lots and over, and 12½c. in smaller lots.

Structural Material.—New inquiry is fairly active, but low prices are still being made, indicating that some of the fabricating shops are not yet filled up. The American Bridge Company has taken 300 tons for stock yards at Herrs Island in this city, and the Pittsburgh Bridge & Iron Works 500 tons for a fertilizer plant at Baltimore. The Carnegie Steel Company will furnish 900 tons of shapes for ore docks for the Pittsburgh & Conneaut Dock Company, Conneaut, Ohio. Prices are very strong, and we quote beams and channels at 1.30c., f.o.b. Pittsburgh, for delivery over remainder of the year.

Plates.—The larger plate mills are well filled up over the next two or three months and are holding firm at 1.30c., but some of the smaller mills are naming 1.25c. for delivery over the next 60 to 90 days. The Standard Steel Car Company has taken an order from the Havana Central Railroad for 695 flat cars, 100 box and 10 caboose cars, and the same company is said to have taken an order for 200 armored steel cars for France. The Atlantic Coast Line has an inquiry out for 800 box cars. Inquiries for cars have been light for some time, and not more than 2500 to 3000 cars and probably about 2500 underframes are actively in the market at present. We quote plates, ¼ in. and heavier, at 1.25c. to 1.30c., f.o.b. Pittsburgh.

Steel Rails.—The Baltimore & Ohio has placed 2000 tons additional and the Pittsburgh & Lake Erie 1200 tons with the Carnegie Steel Company to be rolled at the Edgar Thomson mills. The new demand for standard sections is only fair, and for small lots. Light rails are fairly active, the Carnegie Steel Company having received new orders and specifications in the past week for close to 3000 tons. We quote standard section rails of Bessemer stock at 1.25c., and of open-hearth, 1.34c., f.o.b. Pittsburgh. We quote light rails as follows, in carload lots: 8 and 10-lb. sections, 1.275c.; 12 and 14-lb., 1.225c.; 16 and 20-lb., 1.175c.; 25, 30, 35, 40, and 45-lb. sections, 1.125c. The prices of light rails are materially shaded on large lots.

Tin Plate.—Several makers report specifications against contracts for tin plate as dropping off as they usually do in July and August, while one or two makers state they are holding up well, and that they have actual orders in hand for five to six weeks' output. There is a continued heavy export demand, coming mostly from Asia and South America. One local

ker has just made two large shipments to South erica. The domestic demand is dull. Most of the ger mills are running to nearly full capacity, the erican Sheet & Tin Plate Company operating this k to about 94 per cent. It is stated that $3.15 and her is being obtained on export plate. On small mestic orders, of which there are few, the market nges from $3.10 to $3.20 per base box for 14 x 20 e plates.

Sheets.—The new demand for blue annealed and o for special grade sheets for automobile and deep mping purposes is quite active, but for ordinary k and galvanized sheets is quiet. It is hard to te the galvanized sheet market, as every mill has its n conditions and prices. On the heavier grades, rela- ely low prices are made, based on present cost of elter, while on the lighter gages up to 5c. is quoted. e rate of operations among the mills is showing a ght increase, the American Sheet & Tin Plate Com- ny running this week to about 77 per cent of ca- eity, and other mills at about the same rate or a tle higher. Most mills are now quoting 1.80c. on . 28 Bessemer black sheets, and one or two mills as h as 1.85c. We quote galvanized sheets, No. 28 ge, 4c. to 4.50c., depending on the customer and antity. We quote No. 28 Bessemer black sheets at 0c.; No. 28 galvanized, 4c. to 4.50c.; Nos. 9 and 10 e annealed sheets, 1.35c. to 1.40c.; No. 30 black ate, tin-mill sizes, H. R. & A., 1.95c.; No. 28, 1.90c.; s. 27, 26, and 25, 1.85c.; Nos. 22 to 24, 1.80c.; Nos. to 21, 1.75c.; Nos. 15 and 16, 1.70c. The above prices e for carload lots, f.o.b. at maker's mill, jobbers arging the usual advances for small lots from store.

Wire Rods.—Consumers being covered over the re- ainder of the year, the new demand is not heavy. pecifications are active and wire rods for prompt de- ery are scarce. Two local mills are out of the market sellers, needing all their output of rods for their own ire mills. Prices are very firm, and we quote Besse- er, open-hearth and chain rods at $26 to $27, f.o.b. ittsburgh.

Wire Products.—The new demand for wire nails is iet, but for wire is very active, both foreign and do- stic. Very heavy foreign inquiries for barb wire are ll coming to this district, but local mills have to pass many of these, not being able to make deliveries. wo makers report their entire output of wire practi- lly under contract for the remainder of this year. ost wire nails being shipped out are on the old con- cts at $1.55, but on new orders $1.60 is being quoted. rices to the large trade are as follows: Wire nails, .60; galvanized nails 1 in. and longer taking an ad- nce over this price of $1.75, and shorter than 1 in., .25. Some mills are asking higher prices on galvan- ed nails. Plain annealed wire is $1.40; galvanized rb wire and fence staples, $2.50; painted barb wire, .70; polished fence staples, $1.70, all f.o.b. Pittsburgh, th freight added to point of delivery, terms sixty days t, less 2 per cent off for cash in ten days. Prices on oven wire fencing are 69 per cent off in carload lots, per cent on 1000-rod lots, and 67 per cent on small ts, f.o.b. Pittsburgh.

Skelp.—The market is strong, some mills asking igher prices. The absolute minimum of the market on ooved steel skelp is 1.25c., some makers quoting 1.30c. d higher. Local mills report they are filled up over e next two or three months. We quote grooved steel lp at 1.25c. to 1.30c.; sheared steel skelp, 1.30c. to .35c.; grooved iron skelp, 1.65c. to 1.70c., and sheared on skelp, 1.75c. to 1.80c., delivered to consumers' mills the Pittsburgh district.

Iron and Steel Bars.—Heavy orders for steel rounds r shrapnel purposes continue to be placed with local ills which are now sold up for the next two or three onths or longer. The General Electric Company placed order here last week for 14,000 tons, while Cleveland terests are reported to have placed 140,000 tons. On e smaller sizes of steel bars, the two leading makers e back from six to seven weeks on deliveries. It is ry evident that the steel-bar mills will run to full ca- acity over the remainder of the year and will be com- elled to turn down large foreign orders. None of the steel-bar mills is quoting less than 1.30c., and for fourth quarter 1.35c. is being quoted. We now quote steel bars at 1.30c. for third quarter and 1.35c. for fourth quarter; common iron bars, 1.25c. to 1.30c.; test-iron bars, 1.35c. to 1.40c., f.o.b. Pittsburgh.

Railroad Spikes.—An inquiry has come out from the Pennsylvania Lines West for about 20,000 kegs, on which local makers are figuring. Makers of spikes report they are well filled up over the remainder of the year. Specifications from the railroads are active. Prices are firm and slightly higher. We quote standard sizes of railroad spikes at $1.45, and small railroad and boat spikes at $1.55 per 100 lb., f.o.b. Pittsburgh.

Cold-Rolled Strip Steel.—New demand continues heavy, and makers report they are well filled for the remainder of the year. The Phillips Sheet & Tin Plate Company is figuring on making large addition to its cold-rolled steel mill at Weirton, W. Va. Prices are very firm, and on small lots as high as $2.95 base is being asked. We quote hard-rolled steel, 1½-in. and wider, under 0.20 carbon, sheared or natural mill edge, per 100 lb., $2.85, delivered. Extras, which are standard among all mills, are as follows:

Thickness, in.	Extras for thickness	Extras for soft or intermediate tempers	Extras for straightening and cutting to lengths not less than 24 in.
0.100 and heavier	Base	$0.25	$0.10
0.099 to 0.050	$0.05	0.25	0.15
0.049 to 0.035	0.20	0.25	0.15
0.034 to 0.031	0.35	0.40	0.25
0.030 to 0.025	0.45	0.40	0.40
0.024 to 0.020	0.55	0.40	0.50
0.019 to 0.017	0.85	0.50	1.10
0.016 to 0.015	1.25	0.50	1.10
0.014 to 0.013	1.95	0.50	1.25
0.012	2.30	0.50	coils only
0.011	2.65	0.50	coils only
0.010	3.00	0.50	coils only

Rivets.—Both foreign and domestic demand for rivets is heavy, and makers state they are filled for the next three or four months. Export shipments are active and good prices are being obtained. The demand for structural rivets is reported more active than at any time in more than a year. We quote buttonhead structural rivets at $1.50 to $1.60 and conehead boiler rivets at $1.60 to $1.70 per 100 lb. in carload lots, f.o.b. Pittsburgh, smaller lots bringing from 5c. to 10c. advance.

Nuts and Bolts.—Consumers are specifying very freely against contracts and the new demand is heavy. Prices on bolts are very firm and are likely to show a slight advance within the next few days. Discounts on nuts to the large trade are as follows:

U. S. S. Cold Punched Blank and Tapped, Chamferred, Trimmed and Reamed

½ in. and smaller, hex.....7.8c. per lb. off
⅝ in. and larger, hex.....7.1c. per lb. off
Square, all sizes .....5.6c. per lb. off

Semi-Finished Tapped

½ in. and smaller, hex.....85-10-10-5 off
⅝ in. and larger, hex.....85-10-5 off

Black Bulk Rivets

7/16 x 6½, smaller and shorter.....80-10-5 off

Package Rivets 1000 Pcs.

Black, metallic tinned and tin plated....75-10-10 off

Discounts on bolts to the large trade, effective from July 21, are as follows:

Machine bolts, h. p. nuts, ⅜ x 4-in., smaller and shorter, rolled, 75, 10, 10 & 10; smaller and shorter, cut, 75, 10, 10 & 5; larger or longer, 75 & 10. Machine bolts, C. P. C. & T. nuts, ⅜ x 4 in., smaller and shorter, 75, 10 & 7½; larger or longer, 70, 10 & 7½. Common carriage bolts, ⅜ x 6 in., smaller and shorter, rolled, 75, 10, 10 & 5; smaller and shorter, cut, 75, 10 & 10; larger or longer, 75 & 5. Bolts without nuts, 6 in. and shorter, extra 10; longer lengths, extra, 5. Blank bolts, 75 & 10. Bolt ends with h. p. nuts, 75 & 10; C. P. C. & T. nuts, 70, 10 & 7½. Gimlet point coach screws and cone point lag screws, 80 & 15. Nuts, blank or tapped, h. p. square, 6c. lb. off; h. p. hexagon, 6.70c. lb. off; C. P. C. & T. square, 5.50c. lb. off; hexagon, ⅝ in. and up, 7c. lb. off; smaller, 7.50c. lb. off; C. P. plain, square, 5.40c. lb. off; hexagon, 5.80c. lb. off; C. P. semi-finished, hexagon, ⅝ in and up, 85 & 10; smaller, 85, 10 & 10.

Merchant Steel.—With the demand very active, mills are running to capacity and making heavier shipments than at any time in some months. Prices are firm and on small lots are as follows: Iron finished tire ½ x 1½ in. and larger, 1.50c. base; under ½ x 1½ in., 1.65c.; planished tire, 1.70c.; channel tire, ¾ to ⅞ and 1 in., 2c. to 2.10c.; 1⅛ in. and larger, 2.10c.; toe calk, 2.10c. to 2.20c. base; flat sleigh shoe, 1.85c.; concave and convex, 1.90c.; cutter shoe, tapered or

bent, 2.40c. to 2.50c.; spring steel, 2.10c. to 2.20c.; machinery steel, smooth finish, 1.90c.

Hoops, Bands and Cotton Ties.—The demand for hoops and bands is active and prices are very firm, local makers reporting they are well sold up over the remainder of this year. We quote hoops and bands firm at 1.30c., the latter taking steel-bar card extras. Prices on cotton ties for August delivery are 85½c. per bundle, but nearly all consumers are covered at the 85c. price. Effective Tuesday, Aug. 3, the Carnegie Steel Company and Pittsburgh Steel Company advanced their price on steel hoops to 1.50c., f.o.b. Pittsburgh. Their price on steel bands remains at 1.30c.

Wrought Pipe.—For some time a project has been under way to pipe natural gas from the West Virginia fields to the city of Baltimore. This will likely come up for settlement within the next day or two, and if the project goes through there will likely be two lines of about 18-in. pipe laid, 220 miles in length. The new demand for merchant pipe is only fair, and for oil country goods is very dull. Discounts on iron and steel pipe are firmly held.

Boiler Tubes.—The new demand for locomotive and merchant tubes is heavier than for a long time, but discounts are still shaded to some extent, depending on the order.

Coke.—The market is suffering from a surplus of coke and prices are soft. It is expected that within a short time two or three merchant blast furnaces will start up that will buy coke in the open market, and this may relieve to some extent the surplus of coke that now exists. The Lackawanna Steel Company has an inquiry out for 10,000 tons of coke per month over last quarter of this year. Prices on prompt furnace coke are lower and we quote standard grades at $1.50 per net ton at oven; on contracts for delivery up to Jan. 1, $1.75 to $1.85; standard 72-hr. foundry coke, $2 to $2.25 for prompt and from $2.25 to $2.50 on contracts, all per net ton at oven. The Connellsville *Courier* reports the output of coke in the upper and lower Connellsville regions for the week ended July 24 as 367,095 net tons, a decrease over the previous week of about 4000 tons.

Old Material.—The market on scrap for steel-making purposes is very active and prices are higher. A local consumer has bought within the past week 20,000 to 25,000 tons of heavy steel scrap at the reported price of $13.50, delivered. This has had the effect of firming up the local market, and dealers report they have been offered up to $13.60 by other dealers for selected heavy steel scrap for prompt shipment. It is evident that some dealers have sold scrap short, and are now covering at higher prices. The Pennsylvania Railroad list for July came out last week and contains about 9000 tons. Awards on this scrap will be mailed Aug. 6, and it is likely to bring higher prices than for some months. We note a sale of 1500 tons of selected heavy steel scrap at $13.40, 2000 tons at $13.25 and two lots of 1000 tons each at $13.50 delivered. Other grades of steel scrap are up from 25c. to 50c. a ton. We also note a sale of about 800 tons of low phosphorus melting stock at $16.25, delivered. Dealers are now quoting as follows:

Heavy steel melting scrap, Steubenville, Follansbee, Brackenridge, Sharon, Monessen, Midland and Pittsburgh delivery	$13.25 to $13.50
Compressed side and end sheet scrap	12.00 to 12.25
No. 1 foundry cast	12.00 to 12.25
Bundled sheet scrap, f.o.b. consumers' mills, Pittsburgh district	10.00 to 10.25
Rerolling rails, Newark and Cambridge, Ohio, Cumberland, Md., and Franklin, Pa.	12.50 to 12.75
No. 1 railroad malleable stock	11.00 to 11.25
Railroad grate bars	8.00 to 8.25
Low phosphorus melting stock	16.00 to 16.25
Iron car axles	18.75 to 19.25
Steel car axles	13.75 to 14.00
Locomotive axles, steel	19.75 to 20.25
No. 1 busheling scrap	10.25 to 10.50
No. 2 busheling scrap	7.75 to 8.00
Machine shop turnings	7.50 to 7.75
Old carwheels	11.75 to 12.00
Cast-iron borings	9.00 to 9.25
*Sheet bar crop ends	12.00 to 12.25
Old iron rails	12.75 to 13.00
No. 1 railroad wrought scrap	11.50 to 11.75
Heavy steel axle turnings	9.00 to 9.25
Heavy breakable cast scrap	11.00 to 11.25

*Shipping point.

Chicago

CHICAGO, ILL., Aug. 4, 1915.—(*By Wire.*)

Pig-iron buyers are the most recent of consumers to be inoculated with the fear of raw material shortage. The sudden appearance of inquiry from many sources lacks adequate explanation except on the basis of buying for protection. A desire is apparent to buy even into first half of next year, but producers have little sympathy with transactions running so far into the future. Prices of both Southern and Northern iron are advancing sharply. The market for steel products is steadily assuming the aspects to which developments of the past several weeks have been leading, and conditions in this district are rapidly duplicating those in Eastern markets with respect to shortage of steel. Without the prospect of new billet capacity in operation at Duluth in the near future, the supply of raw steel for some of the mills at Chicago would already present a problem. It is estimated that one interest has orders on its books for the current month nearly 40,000 tons in excess of its steel production. With the mills here serving thus far largely as overflow capacity for the handling of domestic business, practically no steel for ammunition purposes, except in billet form, has been rolled. In the last week, however, a round tonnage of bars has been taken. Structural and plate mills are filled up for the current month, but orders in this line can still be filled in from four to six weeks. Prices of finished steel grow steadily firmer and quotations below 1.30c., Pittsburgh, are increasingly difficult to secure. The placing of 7500 tons of spikes for Russia and an inquiry for a like amount in addition were among the important features of the week. A number of small lots of rails were booked, and tie-plate prices have been again advanced. The unsteadiness of spelter prices has added confusion to galvanized sheet quotations, and little business is being done in this direction. The rush to fill orders for steel scrap on the recent price advance has brought such amounts of material into the market as to check temporarily the upward movement, but the strong tone of the market is unchanged.

Pig Iron.—Realization that recent pig-iron sales have reached a total which will absorb so large a proportion of merchant production during the last half of the year as to place the furnaces in an independent position appears suddenly to have become general. This is notably true with respect to Southern iron, although evidence of some concern regarding Northern iron requirements seems likely to be manifested within the next week. The fact that the large number of idle furnaces leaves but a portion of possible production effective contributes to the quickness with which the situation has changed. Buying even now is not so heavy, nor is the individual tonnage large, but inquiry is appearing from all lines of trade. Producers have stiffened in their prices very sharply. With the exception of Pioneer iron, of which there is very little for sale, Southern quotations are at a minimum of $10.50, Birmingham, with $10.75 noted in several instances, and $11 done in at least one transaction. A few sales are recorded last week on the basis of $10 for No. 2, but the metal involved is almost entirely resale iron. The Lake furnaces have moved up to $13.50 for foundry iron, while for Inland basic $14 is being asked. The following quotations are for iron delivered at consumers' yards, except those for Northern foundry, malleable Bessemer and basic iron, which are f.o.b. furnace, and do not include a switching charge averaging 50c. a ton:

Lake Superior charcoal, Nos. 2 to 5	$15.75
Lake Superior charcoal, No. 1	16.25
Lake Superior charcoal, No. 6 and Scotch	16.75
Northern coke foundry No. 1	$14.00 to 14.25
Northern coke foundry, No. 2	13.50 to 13.75
Northern coke foundry, No. 3	13.00 to 13.25
Southern coke, No. 1 f'dry and 1 soft	14.50 to 14.75
Southern coke, No. 2 f'dry and 2 soft	14.00 to 14.50
Malleable Bessemer	13.50 to 14.00
Standard Bessemer	16.50
Basic	13.50 to 14.00
Low phosphorus	20.00 to 20.50

Wire Products.—The general situation with respect to wire shows considerable improvement. The demand for wire nails, which has been anything but satisfac-

ary, is decidedly better. Woven fence, however, is moving slowly. Barb wire is independent of domestic conditions by reason of the tremendous export demand. The wire mills are increasing their manufacturing operations, particularly in the production of billets and rods. Prices are unchanged. We quote to jobbers as follows: Plain wire, No. 9 and coarser, base, $1.589; wire nails, $1.789 to $1.789; painted barb wire, $1.889; galvanized barb wire, $2.689; polished staples, $1.889; galvanized staples, $2.689, all Chicago.

(By Mail)

Rails and Track Supplies.—Orders placed here have only been for small quantities, among them being 2700 tons from the Chicago & Western Indiana and 2000 tons from the Baltimore & Ohio. Domestic inquiry for spikes is in a measure dwarfed by Russian inquiry for a total of 15,000 tons. Of this, 7500 tons has already been placed at Chicago, and it is expected that the remainder will also be placed here. The Inland Steel Company has withdrawn from the market on spikes and track bolts, largely for the reason that, at the prevailing prices, steel may be more profitably disposed of in other forms. Quotations for tie plates have been advanced to a minimum of $26, f.o.b. mill. We quote standard railroad spikes at 1.50c. to 1.55c., base; track bolts with square nuts, 1.90c. to 2c., base, all in carload lots, Chicago; tie plates, $25 to $26, f.o.b. mill, net ton; standard section Bessemer rails, Chicago, 1.25c., base, open-hearth, 1.34c.; light rails, 25 to 45 lb., 1.07c.; 16 to 20 lb., 1.12c.; 12 lb., 1.17c.; 8 lb., 1.22c.; angle bars, 1.50c., Chicago.

Structural Material.—For the month of August the mills are well sold up on structural shapes, and in consequence September rolling is, for the most part, the best that can be secured. There is, however, less inquiry. Sales in small quantities are being made on a basis of 1.30c., Pittsburgh, and the market presents evidence of considerable firmness at that price, but it is not clear that 1.25c. could not be done on desirable business. Fabricators report that they are figuring on quite a number of small jobs, the First National Bank's building of Omaha, which will require from 2500 to 3000 tons, being the largest now under consideration. Of contracts placed last week, the largest was 410 tons for the Union Trust Company's building at South Bend, Ind., awarded to the Kenwood Bridge Company, and 868 tons of river bridges in San Joaquin County, Cal., taken by the American Bridge Company. About 550 tons was also placed on three additional contracts. No new car inquiries have come to light, and negotiations still pending concern comparatively small lots. We quote for Chicago delivery of structural steel from mill 1.489c.

We quote for Chicago delivery of structural steel out of stock 1.75c.

Plates.—Few new developments have appeared in the plate situation other than a steady increase in the stiffness of the market. Plates are still $1 a ton under shapes and bars, but it seems certain that 1.15c., Pittsburgh, can no longer be done. We quote for Chicago delivery of plates from mill 1.389c. to 1.439c.

We quote for Chicago delivery of plates out of store 1.75c.

Sheets.—With the decline in spelter values, uncertainty as to the market for galvanized sheets has again been accentuated, and a wide range of quotations is noted. Prices as low as 4.25c., Pittsburgh, for No. 28 have been made, while some makers are still asking 4.50c. The position of larger mills which have been out of the market is, however, unchanged. Strict adherence to a minimum of 1.80c., Pittsburgh, for No. 28 black sheets is a more general policy, in keeping with the growing demand for semi-finished steel. Concessions still appear, however, in the heavier gages of blue annealed, due as much to the weakness in plates as to the limited demand for sheets. We quote for Chicago delivery from mill, No. 10 blue annealed, 1.539c.; No. 28 black, 1.989c.; No. 28 galvanized, 4.689c. to 4.789c.

There are still many reasons favoring the purchase of galvanized sheets out of stock, although the relation of store to mill prices is now more nearly normal. Trade continues active. We have revised our prices and quote for Chicago delivery from jobbers' stock as follows, minimum prices applying on bundles of 25 or more: No. 10 blue annealed, 1.95c.; No. 28 black, 2.55c.; No. 28 galvanized, 4.70c.

Bars.—Up to this time mills in this district have rolled practically no steel bars for ammunition manufacture. In the last week, however, it is understood that a round tonnage was booked to be rolled here, although little attention is being given to the inquiry for bars of this description coming from miscellaneous manufacturers, in quantities aggregating fully 50,000 tons. The scarcity of raw steel is becoming pronounced, and relief for the already oversold condition of some of the Chicago mills will have to be found in the shipment of billets from Duluth. Somewhat better prices are being obtained for reinforcing steel, the orders placed by the Illinois Central and Milwaukee railroads last week, for about 250 tons each, bringing prices equivalent to 1.30c., Pittsburgh. The higher prices for steel bars and increasingly tardy deliveries will add strength to the bar-iron market, and the Republic Iron & Steel Company has already advanced its quotations to the basis of 1.25c., Chicago mill. We quote for mill shipment as follows: Bar iron, 1.20c. to 1.25c.; soft steel bars, 1.489c.; hard steel bars, 1.25c.; shafting, in carloads, 65 per cent off; less than carloads, 60 per cent off.

We quote store prices for Chicago delivery: Soft steel bars, 1.65c.; bar iron, 1.65c.; reinforcing bars, 1.65c. base, with 5c. extra for twisting in sizes ½ in. and over and usual card extras for smaller sizes; shafting 55 per cent off.

Cast-Iron Pipe.—The placing of 1200 tons of pipe at Kenosha, Wis., has been arranged, and the formal award, to the leading interest, is expected to follow. The only other municipal work of any size involves the placing of 1500 tons at Cambridge, Ohio. A number of smaller lettings are reported, including 260 tons at Watertown, S. D., and 350 tons at Coldwater, Ohio. We quote as follows, per net ton, Chicago: Water pipe, 4 in., $26; 6 to 12 in., $24; 16 in. and up, $23.50, with $1 extra for class A water pipe and gas pipe.

Old Material.—The extent to which the flurry in steel scrap has brought out material seems, temporarily at least, to have checked the upward movement of the market, and transactions in the last few days have been at prices slightly under the top figures. One of the leading melters of steel is now restricting the delivery of material, so heavy have been the receipts in the last week. The Illinois Steel Company appears to have satisfied its requirements for the time being. For other classes of scrap the demand continues moderate. Among the railroad offerings of old material are a large list from the Baltimore & Ohio, 2200 tons from the Santa Fe, and 4000 tons from Chicago & Northwestern. We have revised our prices and quote for delivery at buyer's works, Chicago and vicinity, all freight and transfer charges paid, as follows:

Per Gross Ton

Old iron rails	$12.25 to $12.50
Old steel rails, rerolling	10.50 to 11.00
Old steel rails, less than 3 ft	11.50 to 12.00
Relaying rails	19.50 to 20.50
Old carwheels	11.50 to 11.75
Heavy melting steel scrap	11.25 to 11.50
Frogs, switches and guards, cut apart	11.25 to 11.50
Shoveling steel	11.00 to 11.25
Steel axle turnings	7.75 to 8.00

Per Net Ton

Iron angles and splice bars	$12.50 to $13.00
Iron arch bars and transoms	12.75 to 13.25
Steel angle bars	10.00 to 10.25
Iron car axles	14.25 to 14.75
Steel car axles	10.50 to 11.00
No. 1 railroad wrought	9.75 to 10.00
No. 2 railroad wrought	9.75 to 10.00
Cut forge	9.75 to 10.00
Steel knuckles and couplers	10.25 to 10.50
Steel springs	10.25 to 10.50
Locomotive tires, smooth	9.75 to 10.00
Machine shop turnings	5.75 to 6.25
Cast borings	5.50 to 6.00
No. 1 busheling	7.50 to 8.00
No. 2 busheling	6.50 to 7.00
No. 1 boilers, cut to sheets and rings	7.00 to 7.50
Boiler punchings	9.00 to 9.50
No. 1 cast scrap	9.50 to 10.00
Stove plate and light cast scrap	8.25 to 8.50
Grate bars	8.00 to 8.50
Railroad malleable	9.50 to 10.00
Agricultural malleable	8.75 to 9.00
Pipes and flues	7.00 to 7.25

Rivets and Bolts.—A lull in the placing of new business is the natural sequence of recent activity, but manufacturers report satisfactory specifications. Western plants are generally on a comfortable manufacturing basis, some of the works operating at capacity. Discounts on nuts are less liberal. A further advance in

price of rivets is announced, and minimum quotations are equivalent to 1.75c., base, Chicago. Quotations are as follows: Carriage bolts up to ⅜ x 6 in., rolled thread, 80-10; cut thread, 80-5; larger sizes, 75-15; machine bolts up to ⅜ x 4 in., rolled thread, with hot pressed square nuts, 80-15; cut thread, 80-10; larger sizes, 80; gimlet point coach screws, 85; hot pressed nuts, square, $6 off per cwt.; hexagon, $7 off per cwt. Structural rivets, ¾ to 1¼ in., 1.75c., base, Chicago, in carload lots; boiler rivets, 10c. additional.

We quote out of store: Structural rivets, 1.95c.; boiler rivets, 2.05c.; machine bolts up to ⅜ x 4 in., 75-15; larger sizes, 70-10-10; carriage bolts up to ⅜ x 6 in., 75-10; larger sizes, 70-15 off; hot pressed nuts, square, $6, and hexagon, $6.70 off per cwt.

Philadelphia

PHILADELPHIA, PA., Aug. 3, 1915.

Quite a number of the Eastern steel mills find themselves so filled with work that they are no longer aggressively seeking business. Deliveries are steadily hardening, and a pronounced firmness in prices has set in. Plates, shapes and bars are now squarely on a 1.30c., Pittsburgh, basis. Few sellers are interested in business involving delivery beyond the third quarter. Export trade has slackened, as most of the current business for shipment abroad involves early delivery, which mills are unable to make. Renewed activity has developed in shipbuilding. Three vessels, two for the Standard Oil Company and a smaller one, went to Delaware River yards, while two large vessels were given to the Newport News Shipbuilding Company, also for the Standard Oil Company. They will require something like 18,000 tons of plates and shapes. The pig-iron market has been quiet, but prices continue to stiffen, and some makers of standard brands of foundry iron are obtaining 25c. more for third quarter and are asking an additional 25c. for fourth quarter. The only movement in steel-making grades has been in low-phosphorus iron. Steel billets are in active demand, but mills are not anxious to sell and prices are based largely upon the nature of individual inquiries. Sharp premiums are paid for early deliveries. New business in ordinary steel bars has been less active. Old material advances steadily. Sellers are not anxious to contract for any large lots under present market conditions.

Pig Iron.—Current business has been light, but higher prices are asked on practically all grades. Sales of steel-making iron will swell the volume of unfilled orders on furnace books for July, although there was little movement in the closing week of the month. Basic has been quiet, with makers holding at $14, delivered, for shipment over the remainder of the year and not anxious to sell for forward delivery at that price. Moderate sales of low-phosphorus pig continue to be made. One Lebanon Valley maker of low phosphorus has sold an aggregate of 2700 tons at prices ranging from $17 to $17.50 at furnace. Lots of a few hundred tons of standard analysis low phosphorus have been sold at a basis of $22 delivered here, although some brands are still available at $21.50. The movement in foundry grades is still light. Consumers are taking small lots and pay higher prices without much question. A sale of 1000 tons of charcoal pig, for last half delivery, was made to an Eastern malleable concern, and this grade is now held at $16.25. Little demand for foundry for extended delivery has developed. Some producers will sell only for third quarter at quoted prices, asking 25c. advance for fourth quarter. Sales as well as shipments of Virginia foundry iron are reported as heavier in July than in the previous month, but there has been little tonnage business. There has been no movement in rolling-mill forge. Cast-iron pipe makers are picking up odd lots of low-grade foundry iron, and as much as $14 delivered has been paid. Quotations for standard brands, delivered in buyer's yards, shipment ranging from third quarter to last half, range about as follows:

Eastern Penna. No. 2 X, foundry	$14.50 to $15.00
Eastern Penna. No. 2 plain	14.25 to 14.75
Virginia, No. 2 X, foundry	15.25 to 15.75
Virginia, No. 2 plain	15.00 to 15.25
Gray, forge	14.00
Basic	14.00 to 14.25
Standard low phosphorus	21.50 to 22.00

Iron Ore.—There has been no movement in this district. Reports that Lake ore sellers have advanced prices 25c. per ton are heard. Importations in the week ended July 31 include 7561 tons from Sweden and [illegible] tons from Chile.

Rails.—Business has been confined to small odd lots, although makers believe that the railroads will release considerable business in the near future.

Ferroalloys.—Sales of moderate lots of 80 per cent ferromanganese could readily be made at $100, seaboard, for foreign, if deliveries were to be had. Foreign producers make few offerings. The tonnage available for sale in the United States is limited and little definite information from abroad is available. Orders, in most cases, are taken only for such quantities as may be afloat. Orders aggregating 500 tons for shipment over the remainder of the year were definitely turned down. Domestic 80 per cent ferromanganese is held at $105 to $115 at furnace, small sales being made at both prices. Fifty per cent ferrosilicon has advanced $2 per ton, the following range of prices now being named for delivery in this district: Up to 100 tons, $75 per ton; 100 to 600 tons, $74; 600 tons and over, $73. Sales of small lots of 11 per cent ferrosilicon have been made at $18 at furnace. Importations of English ferromanganese at this port were negligible last week, the arrival of but fifty tons being reported.

Bars.—A large tonnage of heavy rounds for export is before the trade, but mills are so well filled that many are refusing to quote. A price of 3c. could no doubt easily be obtained if mills were able to make the deliveries required. New business in ordinary steel bars has been quieter, although specifications against contracts have been very heavy. Ordinary steel bars are firmly held at 1.459c., delivered here. Iron bars have been very active, prices having advanced to 1.33c., Eastern mill.

Plates.—With deliveries steadily hardening, consumers have been specifying more freely against contracts, and some Eastern mills have been swamped with definite orders. Even universal plates have been taken more freely. One large Eastern mill names one week delivery on miscellaneous business in universal and four to five weeks on other classes of plates. Four Standard Oil vessels, requiring 11,800 tons of plates, were contracted for in local yards last week. Some of the Eastern plate mills are dodging large contracts, having their books well filled with miscellaneous business. In one case specifications on hand are about three times greater than anything on the books for a very long period. Little forward business has been done. Some few contracts from regular customers have been taken at 1.509c. delivered here, for fourth quarter, but one seller claims that no more will be taken at that basis. Current prices for miscellaneous business, for third quarter, are firm at 1.459c. here.

Structural Material.—Mills are rapidly filling up and in some cases have taken all the business they want for third quarter. Less disposition to contract for fourth quarter is shown. The bulk of the business has been of a miscellaneous character, although one contract for 6000 tons was for an addition for the Baldwin Locomotive Works. Railroad bridge building has been quiet. Prices have developed more firmness, and 1.459c. delivered here is the minimum for plain shapes.

Sheets.—New business, while mostly in small quantities, is coming in at a lively rate. Consumers are making greater efforts to contract for forward delivery, and in some cases business has been done for fourth quarter at several dollars a ton advance over current quotations. For third quarter shipment prices are very firm at 1.559c. to 1.609c. for No. 10 blue annealed, delivered in this district.

Coke.—A better supply of furnace coke has weakened the prompt shipment market and sales of small tonnages have been made at $1.85 per net ton at oven. No large buying is noted. Little business has been moving in contract coke, either furnace or foundry. Foundry coke ranges from $2.60 to $2.75 at oven. Freight rates from the principal producing districts are as follows: Connellsville, $2.05; Latrobe, $1.85; Mountain, $1.65.

Billets.—Delivery is the principal factor, and consumers willingly pay premiums for early shipment. Foreign inquiry for shrapnel billets has been heavy. One Eastern mill quoted on 15,000 tons last week, while other mills refuse to quote. In instances recent quotations for export have been withdrawn as relatively higher prices are being paid by domestic buyers. No quotable price is named for basic open-hearth rolling billets, each transaction being based on its own merits. From $32 to $36 delivered has been paid for early shipments, with forging steel ranging $4 to $6 higher.

Old Material.—The market is steadily gaining in strength. Sales have not been large individually, as holders of material will not take tonnage orders at current prices. With mill activities increasing, and promises of capacity business over the remainder of the year, holders of scrap are waiting for a higher market. Several 1000-ton lots of heavy melting steel scrap have been sold at $13 delivered and sellers are now disposed to hold for $13.50. With prices of billets and heavy bars up, and deliveries hard to get, a sharp demand for old steel axles and old shafting has developed. As high as $16.50 has been paid for axles. Cast scrap has been rather inactive, although stove plate and grate bars have been in better demand, and are quotably higher. Quotations for delivery in buyers' yards in this district, covering eastern Pennsylvania and taking freight rates from 35c. to $1.35 per gross ton, are as follows:

No. 1 heavy melting steel	$13.00 to $13.50
Old steel rails, rerolling (nominal)	13.00 to 13.50
Low phos. heavy melting steel scrap	15.50 to 16.00
Old steel axles	15.50 to 16.50
Old iron axles (nominal)	18.00 to 18.50
Old iron rails (nominal)	15.50 to 16.00
Old carwheels	12.75 to 13.25
No. 1 railroad wrought	14.00 to 14.25
Wrought-iron pipe	12.00 to 12.50
No. 1 forge fire	9.00 to 9.50
Bundled sheets	9.25 to 9.75
No. 2 busheling	7.75 to 8.25
Machine shop turnings	9.25 to 9.75
Cast borings	9.25 to 9.75
No. 1 cast	12.50 to 13.00
Grate bars, railroad	10.00 to 10.50
Stove plate	10.00 to 10.50
Railroad malleable (nominal)	10.00 to 10.50

Cleveland

CLEVELAND, OHIO, Aug. 3, 1915.

Iron Ore.—Lake ore shipments during July were 7,204,020 gross tons or 1,200,000 tons greater than those in June. In July, 1914, shipments were 5,784,514 tons. The total Lake movement until Aug. 1 was 18,725,304 tons, as compared with 15,408,630 tons for the corresponding period a year ago, or an increase of 3,316,674 tons. The market shows little activity, although a few small lot sales are being made. Sales to Eastern consumers so far this season are estimated at less than 500,000 tons. We quote prices as follows delivered to lower lake ports: Old Range Bessemer, $3.75; Mesaba Bessemer, $3.45; Old Range non-Bessemer, $3.00; Mesaba non-Bessemer, $2.80.

Pig Iron.—The market is fairly active and prices are very firm. One local interest has advanced its price on foundry iron to $13.75 for No. 2, delivered Cleveland, and to $13.25 to $13.50 for outside shipment, although outside business is still being taken at $13. Local sales include 1000 tons of basic at $13.50 delivered and 1500 tons of malleable. Quotations for delivery into next year range from $13.25 to $13.50. Among new inquiries is one from a Bucyrus consumer for 700 tons of Northern foundry iron. In connection with the purchase of a round tonnage of foundry and malleable iron by foundries connected with a Toledo automobile manufacturing company, a Pontiac, Mich., foundry has taken 5000 tons of Ohio silvery iron, and prices on silvery have stiffened up. While this iron can still be had at $15 at furnace for 8 per cent, a sale of a small lot is reported at $16. Southern iron has advanced to $10.25 to $10.50 for No. 2 for the last half and a local foundry has taken 500 tons at the former price. A leading sanitary interest is in the market for a round lot of Nos. 2 and 3 Southern for the fourth quarter delivery. Several inquiries have come out for Southern iron for shipment during the first half but so far furnaces have refused to quote for that delivery. We quote delivered Cleveland as follows:

Bessemer	$15.20
Basic	$13.50 to 13.75
Northern No. 2 foundry	13.50 to 13.75
Southern No. 2 foundry	14.25 to 14.50
Gray forge	13.25
Jackson Co. silvery 8 per cent silicon	16.62
Standard low phosphorus at Valley furnace	20.50 to 21.00

Coke.—Foundry-coke shipments are heavy, but new demand is light. Standard makes are quoted at $2.25 to $2.60 per net ton at oven. Furnace coke is held at $1.75 to $1.85 for contracts and about 10c. lower for prompt shipment. A southern Ohio consumer has sounded the market with an inquiry for furnace coke for the first half and is reported to have secured no quotations below $2.35.

Finished Iron and Steel.—Specifications in the past week were very heavy, few consumers allowing any of their contract tonnage for July to be cancelled. New demand is active but few mills are able to make deliveries wanted. One mill that is better situated in this respect than others, being able to make shipments in 60 to 90 days, is getting 1.35c., Pittsburgh, for steel bars in carload lots from buyers other than regular customers. Some orders are being placed in this territory with Eastern mills for small lots of structural material and universal plates, the buyers being willing to pay the additional freight charges to get early deliveries. A Cleveland manufacturer is in the market for 16,000 tons of forging bars for 2,000,000 3¼-in. shells for Russia. Delivery on this steel is wanted to start in 50 days. An Ohio maker of automobile bearings has an inquiry out for 10,000 tons of alloy and open-hearth steel for the first half. Some of the leading automobile builders have covered for their steel requirements for that delivery. The outlook in the Lake boat building industry has improved and builders are now figuring on several boat contracts. Prices on black and blue annealed sheets are firmer, some of the mills asking 1.80c. to 1.85c. at mill for No. 28 black, and 1.40c. to 1.45c. for No. 10 blue annealed. The Lackawanna Steel Company has taken 500 tons of 70-lb. standard section rails for the Cleveland, Painesville & Eastern Railroad. A local mill is quoting forging billets at $30, Cleveland. Bar iron is unchanged at 1.15c., Pittsburgh. Hard steel bars are firmer, quotations now ranging from 1.15c. to 1.20c., Pittsburgh. We quote warehouse prices at 1.80c. for steel bars and 1.90c. for plates and structural material.

Bolts, Nuts and Rivets.—The demand for bolts and nuts is heavy and prices are stiffening up, the 5 per cent reduction in discounts on large machine and large carriage bolts and the $3 to $5 a ton advance on all nuts noted last week becoming more general. However, as some makers are still taking business at the old prices, quotations below are not changed. The demand for rivets is more active. We quote rivets at 1.50c., Pittsburgh, for structural and 1.60c. for boiler rivets. Bolt and nut discounts are as follows: Common carriage bolts, ⅝ x 6 in., smaller or shorter, rolled thread, 75, 10 and 10 per cent; cut thread, 75, 10 and 10 per cent; larger or longer, 75 and 10 per cent; machine bolts with h. p. nuts, ⅝ x 4 in., smaller or shorter, rolled thread, 75, 10, 10 and 10 per cent; cut thread, 75, 10, 10 and 5 per cent; larger or longer, 75 and 15 per cent; coach and lag screws, 80 and 20 per cent; square h. p. nuts, blank or tapped, $6.30 off; hexagon h. p. nuts, blank or tapped, $7.10 off; c.p.c. and t. square nuts, blank or tapped, $5.80 off; hexagon, ⅝ in. and larger, $7.25 off; 9/16 and smaller, $8 off; semi-finished hexagon nuts, ⅝ in. and larger, 85, 10 and 10 per cent; 9/16 and smaller, 85, 10, 10 and 10 per cent.

Old Material.—The market is very firm and prices on heavy melting steel and several other grades, mostly railroad scrap, are higher. There is more activity than during the previous few weeks but trading is almost entirely between dealers. Dealers who have sold short are paying more for material than mills are willing to pay. Dealers generally are unwilling to sell for ex-

tended future deliveries unless they can cover quickly for the material. In the aggregate a large tonnage of railroad scrap is being offered this week in the lists sent out by the Pennsylvania Company, the Pennsylvania Railroad, the New York Central and the Wheeling & Lake Erie. We quote, f.o.b. Cleveland, as follows:

Per Gross Ton

Old steel rails, rerolling	$11.00 to $11.75
Old iron rails	12.00
Steel car axles	13.00 to 13.25
Heavy melting steel	11.00 to 11.50
Old carwheels	9.75 to 10.00
Relaying rails, 50 lb. and over	22.50
Agricultural malleable	8.50
Railroad malleable	10.75 to 11.25
Steel axle turnings	8.75 to 9.00
Light bundled sheet scrap	8.50 to 8.75

Per Net Ton

Iron car axles	$14.75 to $15.25
Cast borings	6.25 to 6.75
Iron and steel turnings and drillings	5.50 to 6.00
No. 1 busheling	8.75 to 9.00
No. 1 railroad wrought	9.75 to 10.00
No. 1 cast	10.00 to 10.50
Railroad grate bars	8.00 to 8.50
Stove plate	8.00 to 8.25

Cincinnati

CINCINNATI, OHIO, Aug. 4, 1915.—(*By Wire.*)

Pig Iron.—The market is advancing under heavy inquiry and large sales. Consumers of basic iron in this vicinity have further augmented their previous purchases by taking on additional tonnages for shipment through the first half of next year. It is estimated that over 100,000 tons was bought by nearby steel plants in July. The bulk of this iron was sold by Hanging Rock and Columbus furnaces, but a Lake producer is understood to have booked about 30,000 tons of the total mentioned. Two basic inquiries are still pending, one from southern Ohio for approximately 18,000 tons and another from central Indiana for 10,000 tons, both for first half. The foundry iron situation also shows considerable improvement. Among sales reported is one to a local melter of 6000 tons of mixed Southern and Northern grades and two other local firms booked approximately 500 tons of Southern iron for shipment this year, indicating that consumers had not fully covered for this year's requirements as had been previously understood. Other foundry iron sales of both Northern and Southern brands were made in Indiana territory, but as far as Southern iron is concerned no contracts have been taken for delivery beyond Jan. 1, as furnaces in the South have not yet opened their books for first half shipment. Prices on both Northern and Southern iron have again scored an advance and the best quotation to-day on the former is $13.25, Ironton, for any shipment this year and $13.50 for the first half of next year. Southern No. 2 foundry for this year only is quoted at $10.50, Birmingham basis, but there is yet some prompt iron that can be obtained at $10.25. The Ohio silvery irons are now quoted around $16 at furnace, a number of good-sized contracts having lately been closed. The demand for Lake Superior charcoal iron shows some improvement, and a sale of 4000 tons was made to a Michigan melter for this year's delivery. Malleable is also in better demand and a central Ohio manufacturer is expected to close this week for 10,000 tons to be shipped in the first half of next year. Other fair-sized inquiries out for this delivery include 7000 tons of Southern foundry iron for the different plants of a sanitary manufacturing concern and a large pump maker is inquiring for 2000 tons, part of which is to be shipped this year. Taken as a whole, the situation is decidedly stronger than it was a week ago. Based on freight rates of $2.90 from Birmingham and $1.26 from Ironton, we quote, f.o.b. Cincinnati, as follows:

Southern coke, No. 1 f'dy and 1 soft.	$13.65 to $14.15
Southern coke, No. 2 f'dry and 2 soft.	13.15 to 13.65
Southern coke, No. 3 foundry	12.65 to 13.15
Southern No. 4 foundry	12.15 to 12.65
Southern gray forge	11.65 to 12.15
Ohio silvery, 8 per cent silicon	17.01 to 17.26
Southern Ohio coke, No. 1	15.51 to 16.01
Southern Ohio coke, No. 2	14.51 to 15.01
Southern Ohio coke, No. 3	14.26 to 14.51
Southern Ohio malleable Bessemer	14.51 to 14.76
Basic, Northern	14.51 to 14.76
Lake Superior charcoal	16.20 to 17.20
Standard Southern carwheel	26.90 to 27.40

(*By Mail*)

Finished Material.—Galvanized sheets are somewhat weaker and the mills in this vicinity are quoting No. 28 gage around 4.25c. to 4.50c., Pittsburgh basis. The warehouse quotation of 4.50c., Cincinnati, is unchanged, but stocks are diminishing at a rapid rate, due to a better demand for small quantities from local consumers. Black sheets are a trifle firmer and are quoted by nearby mills around 1.90c., Pittsburgh basis. Steel bars are quoted from Cincinnati warehouse stocks at 1.90c., and there is a fairly good demand from different sources. Structural shapes are firm at 2c., cut to length when desired. Hoops and bands show some improvement and are quoted at 1.30c. for steel bands and 1.35c., Pittsburgh, for steel hoops. Railroad track material is also more active.

Coke.—Shipments are going forward on contracts at a satisfactory rate, but new business is confined almost entirely to foundry coke purchases by a few consumers who have not covered for their entire requirements. We quote Connellsville 42-hr. coke around $1.65 to $1.70 per net ton at oven for nearby shipment, with about 10c. to 15c. per ton added for long time contracts. Both Connellsville and Wise County foundry coke ranges from $2.25 to $2.60 per net ton at oven, with the latter figure representing the contract price for a number of the standard brands.

Old Material.—While there has been no general advance in quotations, prices are very firm. Both the rolling mills and foundries have lately contracted for quite a large tonnage of scrap, and it is understood that their needs have not yet been fully supplied. The minimum figures given below represent what dealers are willing to pay for delivery in their yards, southern Ohio and Cincinnati, and the maximum quotations are dealers' prices, f.o.b. at yards:

Per Gross Ton

Bundled sheet scrap	$7.75 to $8.25
Old iron rails	11.00 to 11.50
Relaying rails, 50 lb. and up	19.75 to 20.25
Rerolling steel rails	9.50 to 10.00
Heavy melting steel scrap	9.50 to 10.00
Steel rails for melting	9.50 to 10.00

Per Net Ton

No. 1 railroad wrought	$9.00 to $9.50
Cast borings	5.50 to 6.00
Steel turnings	5.25 to 5.75
Railroad cast scrap	9.75 to 10.25
No. 1 machinery cast scrap	11.00 to 11.50
Burnt scrap	7.00 to 7.50
Old iron axles	14.00 to 14.50
Locomotive tires (smooth inside)	9.00 to 9.50
Pipes and flues	6.50 to 7.00
Malleable and steel scrap	7.75 to 8.25
Railroad tank and sheet scrap	5.75 to 6.25

Birmingham

BIRMINGHAM, ALA., Aug. 2, 1915.

Pig Iron.—The market is undoubtedly higher, stronger and more confident, while the consumer has commenced to display nervousness as to future requirements, especially 1916 delivery. The event of the week was the flat-footed announcement of the leading interest that it was out of the market for the remainder of the year and had advanced to $12.50 on 1916 delivery. The next two largest producers decline to quote for 1916, but have nothing under $10.50 for the remainder of the year. There is but one company which offers $10 iron, and it has practically no No. 2 soft nor Nos. 3 and 4 foundry, having been forced to turn down orders. An $11 market within a short time is not improbable. Recent sales have been largely on the $10.50 basis and for regular customers, all makers being well taken care of, stocks included, for the rest of the year. Several offers of $10.50 for last half have been turned down on the plea of prior bookings to capacity. Two of the principal interests each sold about 7000 tons in July. One maker sold about 40,000 tons, much more than its output. The crux of the situation is large sales against furnace capacity. The Sloss-Sheffield has blown in one of its City furnaces, giving it four active stacks. The Tennessee Company has six on basic and two on foundry, the Woodward three on foundry, the Republic two on foundry, the Gulf States Steel one on basic, the Central Coal & Iron one on foundry, and the Ala-

ama one on special Clifton iron. Woodward expects blow in Vanderbilt Sept. 1, depending on completion additions to its by-product coke plant. One and possibly two Bessemer stacks will go in very soon. ne of the most conservative and best-posted authoriies says that the demand for steel-making iron is oing to cause many merchant furnaces to make basic, nd there is going to be less foundry iron, hence a tronger foundry iron market. The situation in the outh is the best it has been in months. While stove lants are working on short time and sanitary pipe hops are in somewhat similar condition, the merchant achine shops, although not well taken care of for he future, are very busy, due to special rush orders or resuming furnaces, etc. Stocks of pig iron dereased considerably in July. With a strong tendency o further advance, we quote, per gross ton, f.o.b. Birmingham district furnaces, as follows:

No. 1 foundry and soft	$10.50 to $11.00
No. 2 foundry and soft	10.00 to 10.50
No. 3 foundry	9.50 to 10.00
No. 4 foundry	9.25 to 9.50
Gray forge	9.00 to 9.25
Basic	10.00 to 10.50
Charcoal	22.00 to 22.50

Cast-Iron Pipe.—The water and gas pipe factories are continuously busy at about 80 per cent capacity, with no accumulations. Recent orders are not heavy and specifications for the future might be more satisfactory. The soil pipe makers report dull conditions, owing to inactivity in the building trades. We quote, per net ton, f.o.b. pipe shop yards, as follows: 4-in., $20.50; 6-in. and upward, $18.50, with $1 added for gas pipe.

Coal and Coke.—Coke is stronger, owing to greater furnace activity and an increase in demand from the foundries. Shipments to Texas points have been liberal and some coke has been going to Florida and the Pacific coast. Prices have not advanced, but the trend is that way. Customers are more easily found. We quote, per net ton, f.o.b. oven, as follows: Beehive furnace, $2.50 to $2.75; beehive foundry, $3 to $3.25; by-product, $2.25 to $2.50, with some grades higher. It looks as if coal will be the last of the minerals to feel the rising tide, prices remaining low and output recovering slowly except with the furnace companies. The Alabama & New Orleans Transportation Company's self-propelling barges will carry coal from the Tennessee Company's Edgewater mines to Mobile and New Orleans. The Mobile Coal Company has contracted for six barges to enter the Warrior River coal trade, and the Frisco Railroad is arranging spur tracks for Warrior River mines to dump coal on barges at Cordova, head of navigation. Government engineers have recently completed an inspection of Sanders Ferry, above Cordova, where an effort is being made to have another dam put in, thus carrying navigable water further north into the coal fields.

Old Material.—The scrap market has picked up. There are scarcely any stocks on hand. Steel and stove scrap have been especially active and prices are firm. All grades on hand have found ready sale. Quotations bid fair to sympathize with the rising iron market in the near future. We quote, per gross ton, f.o.b. dealers' yards, as follows:

Old iron axles	$13.00 to $13.50
Old steel axles	12.50 to 13.00
Old iron rails	12.50 to 13.00
No. 1 railroad wrought	8.00 to 8.50
No. 2 railroad wrought	7.50 to 8.00
No. 1 country wrought	8.00 to 8.50
No. 1 machinery cast	8.25 to 8.75
No. 1 steel scrap	8.00 to 8.50
Tram carwheels	8.25 to 8.75
Stove plate	7.25 to 7.75

Developing from the successful glee club organized by the men of the Berger Manufacturing Company, Canton, Ohio, a contest between quartets from every factory and department store in that city will be arranged for the Labor Day celebration. The object of the movement is good fellowship as well as musical training. Trophies will be offered to stimulate the enthusiasm in each factory to strive for a winning team.

St. Louis

ST. LOUIS, MO., Aug. 2, 1915.

Pig Iron.—Decidedly increased activity has been noted and more furnaces have notified representatives of advance of prices to $10.50 for No. 2 Southern, Birmingham basis, and none in this market is willing to accept present prices for 1916 deliveries. A large number of inquiries are out, including one for 1500 tons of No. 2 Southern and one for 2000 tons of malleable iron. Ferromanganese is quoted here at $125 per ton seaboard.

Coke.—Quotation on the local by-product coke remains nominally in consonance with Connellsville prices, but cuts are made which keep other cokes out.

Finished Iron and Steel.—Deliveries are becoming more extended, 30 to 40 days being the minimum. The 1.30c., Pittsburgh, price is being strongly held. Movement out of stock is heavier than ever, at the following prices: Soft steel bars, 1.70c.; iron bars, 1.65c.; structural material, 1.80c.; tank plates, 1.80c.; No. 10 blue annealed sheets, 2c.; No. 28 black sheets, cold rolled, one pass, 2.55c.; No. 28 galvanized sheets, black sheet gage, 4.85c.

Old Material.—Quotations are moving upward. Considerable inquiry is being received from foundries, rolling mills and the steel mills. Relaying rails are firm and difficult to get. The lists out include 500 tons from the Vandalia and 12,000 from the Baltimore & Ohio, but others will come forward in the week, as usual in this part of the month. We quote dealers' prices, f.o.b. St. Louis, as follows:

Per Gross Ton	
Old iron rails	$11.00 to $11.50
Old steel rails, re-rolling	11.25 to 11.75
Old steel rails, less than 3 ft.	11.25 to 11.75
Relaying rails, standard section, subject to inspection	22.00 to 23.00
Old carwheels	10.25 to 10.75
No. 1 railroad heavy melting steel scrap	10.50 to 10.75
Shoveling steel	9.25 to 9.50
Frogs, switches and guards cut apart	10.75 to 11.00

Per Net Ton	
Iron angle bars	$10.50 to $11.00
Steel angle bars	9.25 to 9.50
Iron car axles	15.00 to 15.25
Steel car axles	11.75 to 12.25
Wrought arch bars and transoms	12.50 to 13.25
No. 1 railroad wrought	9.50 to 10.00
No. 2 railroad wrought	9.00 to 9.25
Railroad springs	9.50 to 9.75
Steel couplers and knuckles	9.50 to 9.75
Locomotive tires, 42 in. and over, smooth inside	10.00 to 10.25
No. 1 dealers' forge	8.50 to 8.75
Mixed borings	6.00 to 6.25
No. 1 busheling	8.00 to 8.25
No. 1 boilers, cut to sheets and rings	6.50 to 7.00
No. 1 railroad cast scrap	9.00 to 9.50
Stove plate and light cast scrap	7.75 to 8.25
Railroad malleable	8.00 to 8.25
Agricultural malleable	7.00 to 7.25
Pipes and flues	7.00 to 7.50
Railroad sheet and tank scrap	7.00 to 7.25
Railroad grate bars	7.00 to 7.25
Machine shop turnings	6.50 to 6.75
Bundled sheet scrap	6.50 to 6.75

San Francisco

SAN FRANCISCO, CAL., July 27, 1915.

The local situation continues extremely dull, purchases everywhere being curtailed as much as possible. A few special orders are appearing, but there is no activity in new construction, and building, though better than at the first of the year, is far below normal. The stiffening in the East is reflected here slightly, and jobbers are beginning to figure on their fall requirements, but with a fair tonnage left from spring purchases they are reluctant to buy. More encouragement is derived from continued foreign inquiries. Reports as to transcontinental freight rate changes are somewhat confusing and have caused some uncertainty as to local values, but one probable effect will be to bring more material to this coast from the Chicago district.

Bars.—The Oriental demand noted here is mainly for steel bars for building, and the tonnage appears to be increasing. The nearby demand is light, inquiries for reinforcing steel, while numerous, being small, and merchant bars receive little attention. Local mills are

still anxious for business, but are gradually filling up, and prices are held with increasing firmness.

Structural Material.—The Seattle bridge contract has been placed with the American Bridge Company. The McClintic-Marshall Company has taken about 250 tons for a crane at the Western Fuel Company's bunkers, Oakland. A good-size theater job in Oakland is being figured, and bids will be taken Aug. 8 for the University of California hall, about 2000 tons. Inquiries are still coming in for small country bridges, but they are slow to close. Notwithstanding the firmness of prices, fabricators are buying little except for work in hand.

Plates.—Oil tank business continues to appear in fair volume, though without single orders requiring heavy tonnage. It is announced that the Union Oil Company has placed a contract with the Union Iron Works for another oil tank steamer of 75,000 bbl. capacity, duplicating the one ordered in May. The Western States Gas & Electric Company is preparing to build a new penstock on the American River near Placerville, Cal.

Sheets.—Galvanized sheets continue dull, with warehouse stocks diminishing slowly and practically no orders going through to the mills. Jobbing prices are still figured on the basis of 4.50c., Pittsburgh, for No. 28. There is a tendency to substitute black for galvanized, but the demand is not active. Only a moderate movement is noted in blue annealed, though the trend toward higher prices is arousing some interest.

Wrought Pipe.—The Southern California Gas Company has placed a contract with the National Tube Company for fourteen miles of 8¼-in. casing. No other important business is noted, though a good many small orders are coming from oil interests. Distributive trade is lifeless, and merchants are not disposed to replenish their stocks.

Cast-Iron Pipe.—The only recent order of any consequence is for 300 tons, placed by Phoenix, Ariz., with the United States Cast Iron Pipe & Foundry Company. No municipal inquiries worth mentioning are in the market at present, and there is not much in sight for the near future.

Pig Iron.—A shipment of 500 tons of Chinese iron arrived July 19. Otherwise no foreign iron has appeared, and spot offerings are gradually diminishing, though supplies of most varieties are ample for nearby requirements. Southern iron continues to arrive in small lots, and the firmer feeling as to values is bringing out a little more interest, though buyers hesitate to place large contracts until local business shows more life.

Coke.—Spot offerings of foreign coke are getting down to comparatively small proportions, with no large tonnage on the way. Prices from local yards are firmly held at $14 to $15 per net ton. Frequent shipments of domestic coke are coming in, and any revival in the foundry trade would no doubt bring out a good demand.

Old Material.—Steel melting scrap is still moving to some extent at $6 to $8 per gross ton, though local dealers are holding out for an advance. As there are many scattered offerings around the State, however, it is not believed that prices will go much higher. Foundries are taking cast scrap in small lots as required at $14 to $15 per net ton.

New York

NEW YORK, August 4, 1915.

Pig Iron.—The pig-iron market is more active and the advancing tendency more pronounced. In the past week probably 20,000 tons has been sold through local offices and upwards of 20,000 tons is now under inquiry. A locomotive works at Schenectady, N. Y., has bought upward of 7000 tons of foundry iron for delivery this year, the business going to three New York State producers, one at Buffalo, one on Lake Ontario and one in eastern New York. The International Steam Pump Company has been in the market for 3000 tons—1500 tons for Holyoke, Mass., 500 tons for Harrison, N. J., and 1000 tons for its foundry in the Cincinnati district. A New Jersey buyer at Elizabethport has taken 1500 tons of low silicon irons, making about 4500 tons bought for this foundry in the past month. Practically all the transactions referred to were for delivery this year. There are inquiries for 1916 iron, but little has been done thus far. While furnace companies prefer not to quote for next year and some are declining to do so the general disposition is to ask $1 advance for the first quarter of the new year. For Buffalo iron the minimum quotation now appears to be $13 for No. 2 X, but in some cases $13.50 at furnace is asked for this year's delivery. Furnaces in eastern Pennsylvania have advanced their prices, and whereas $14.50 at furnace for No. 2 X was a high figure last week and sales are still made at less, the Empire Steel & Iron Company has now advanced its price to $14.75 at furnace. Virginia irons are higher, one interest announcing an advance of 25c. to $13 at furnace for No. 2 X, but $12.75 is believed to have been done. Predictions of further advances in all Eastern markets are freely made, the indication being that foundry iron, which so long has refused to move, is now to share to some extent, at least, in the advances which have marked the trade in steel products. We quote at tidewater as follows: No. 1 foundry, $15 to $15.25; No. 2 X, $14.75; No. 2 plain, $14.25 to $14.50; Southern iron, $15.25 to $15.50 for No. 1 and $15 for No. 2.

Ferroalloys.—Representatives here of British producers of ferromanganese are still in the dark as to the extent of the restrictions in the exports. Advices have been received that September receipts, or August shipments, will be very meager. The opinion is general that the amount released for export from England in the last quarter of the year will be much smaller than that shipped to this country in the past three months, which was about 20,000 tons, only 548 tons having come in in the first three months of 1915, when the embargo was in effect. Shipments are still being received on consignments released in July, and some sales of small lots are reported at $100, seaboard. One broker is entirely sold up and is not quoting. Little is heard of sales of domestic ferromanganese. A prediction is afloat that the price will reach $150, seaboard, before the snow flies, or even higher. Sales of Brazilian manganese ore have been made as high as 41c. per unit, seaboard, and more Cuban ore is expected to be brought in in the near future. Spiegeleisen is firm at $26 at furnace for the better grades, and inquiry for it, as a partial substitute for ferromanganese, is more active. It is understood to be pretty well sold up for the balance of the year. Ferrosilicon, 50 per cent, is more in demand than in many years, both from domestic and foreign sources. Orders are being filled with difficulty, as stocks in producers' hands are reported low. The price is firm at $71 to $73, Pittsburgh.

Structural Material.—Late public lettings have shown keen competition and little evidence of betterment in prices of fabricated material, a fact which is given most weight this week in the claims that buying of plain material at 1.25c. Pittsburgh, is still possible, though sellers now claim 1.30c. Pittsburgh, as a minimum. The new projects of chief importance appearing are for railroads, but there is nothing in them on which one may hang hopes of increased railroad buying. The railroad work includes 800 tons for five bridges for the Pennsylvania, 600 tons for two bridges for the Chesapeake & Ohio and 200 tons at Johnson, Vt., for the Boston & Maine. Awards for railroad work embrace in part 700 tons for the New York, Ontario & Western and 1600 tons for the Philadelphia & Reading at Milton, Pa., both to the Pennsylvania Steel Company. The Phoenix Bridge Company is low on 4200 tons for third tracking the Myrtle Avenue elevated line, Brooklyn, for the New York Municipal Railways. Milliken Brothers have taken 2000 tons for Cuban railroad bridges and the Hay Foundry & Iron Works, 200 tons for a highway bridge over the Passaic River. Some of the general building work closed is: 1100 tons for the Hotel des Artistes, Sixty-seventh Street near Central Park West, to the Passaic Structural Steel Company; 700 tons for Balch, Price & Co., Brooklyn, to Milliken Brothers; 550 tons for a hangar for the United

States Navy at Pensacola, Fla., and 450 tons for the Bergen Building, Bronx borough, both to the American Bridge Company; 450 tons for the Kenmore apartment, Boston, to the Boston Bridge Works; 450 tons for the Schaefer Brewery to the George A. Just Company, and 400 tons for the Mount Vernon post office to William B. Shafer & Co. We quote mill shipments at 1.25c., Pittsburgh, for attractive lots but 1.30c., Pittsburgh, or 1.469c., New York, for the usual order of business. For small lots from store we quote 1.95c. to 2c., New York.

Steel Plates.—Quotations of Eastern mills have advanced; 1.25c., Pittsburgh basis, is asked by one mill, and $1 a ton higher by at least another. Shipments in some sizes cannot be obtained inside of four or five weeks, except on universal plates, which, however, have shown a better demand. Mills have six to eight weeks' work ahead, but it is probable that the bulk of this is material bought under contract at 1.15c. Pittsburgh basis. Export prices have strengthened materially, but quotations appear to range from about 1.20c. Pittsburgh, to slightly over 1.30c. Pittsburgh, taking into account the freight rate of 10.5c. per 100 lb. from Pittsburgh to seaboard. The export movement mainly consists of small lots. In domestic business, Jersey City, it is expected, will shortly be in the market for ten miles of 6-ft. pipe involving about 10,000 tons. Railroad car business has not yet moved upward, but it is expected that before long the New York Central will decide definitely on 500 or 1000 automobile cars, the actual facts being difficult to ascertain owing to secrecy with which the inquiries have been surrounded. The chief business of the week covers 500 underframes for the Chicago Great Western placed with the American Car & Foundry Company, which is also to build fifty caboose cars for the Chesapeake & Ohio, and 600 underframes taken by the Mount Vernon Car Mfg. Company for the Gadsden Car Works. Some of the new business under consideration includes 75 to 100 tank cars for the American Steel & Wire Company (Newburgh & South Shore); 500 center constructions for the Cincinnati, Hamilton & Dayton, and 1000 hopper car bodies for the Baltimore & Ohio. We quote 1.25c. to 1.39c., Pittsburgh, or 1.419c. to 1.469c., New York, for mill shipments. Plates from store are 1.95c. to 2c., New York.

Iron and Steel Bars.—New buying is of small volume but specifications are heavy. Consumers are probably all covered for the quarter's requirements. Deliveries are not promised within sixty days for Bessemer steel bars and not within ten or more weeks in the case of open-hearth steel bars. Bar iron is similarly strong and more is heard of refined iron bars being substituted for steel bars. The American Iron & Steel Mfg. Company announces a further advance in bar iron and this time places the price on a Pittsburgh basing of 1.25c., minimum. This is the third advance made by this company in less than three weeks, or an advance in this time of between $3 and $3.50 per ton. The company states as its reasons for the advance that not only is demand more active but the cost of manufacture has been increasing. We quote mill shipments of steel bars at 1.30c., Pittsburgh, or 1.469c., New York, and refined iron bars 1.35c. to 1.419c., New York. Out of store in New York iron and steel bars are 1.90c. to 1.95c.

Cast-Iron Pipe.—The most important public letting in sight this week is that of the city of Perth Amboy, N. J., on 3000 tons of various sizes, running from 4 to 20 in., on which bids will be opened to-day (Wednesday). The volume of business coming from private buyers is excellent, and a steady flow of inquiries is being received, indicating further purchases. Prices are well maintained and carload lots of 6-in., class B and heavier, are now quoted at $23 to $23.50 per net ton, tidewater, class A and gas pipe taking an extra of $1 per ton.

Old Material.—The better movement noted for the past fortnight continues to gain strength. Large consumers are buying much more freely and are not now hesitating to cover their requirements for some time into the future. Heavy quantities of steel melting scrap have been sold and the iron rolling mills have also been liberal buyers. Prices are slightly higher than last week, with the tendency still upward. Brokers are paying about as follows to local dealers and producers, per gross ton, New York:

Old girder and T rails for melting	$10.25 to $10.50
Heavy melting steel scrap	10.25 to 10.50
Relaying rails	19.00 to 19.50
Rerolling rails	10.25 to 10.50
Iron car axles (nominal)	15.25 to 15.75
Steel car axles	13.50 to 14.00
No. 1 railroad wrought	11.25 to 11.75
Wrought-iron track scrap	10.50 to 11.00
No. 1 yard wrought, long	10.25 to 10.75
No. 1 yard wrought, short	9.75 to 10.25
Light iron (nominal)	3.25 to 3.75
Cast borings	6.75 to 7.00
Wrought turnings	6.75 to 7.00
Wrought pipe	9.25 to 9.50

Foundries are steadily but moderately increasing their consumption of scrap, and transactions are increasingly numerous. Dealers' quotations to consumers of cast scrap are as follows, per gross ton, New York:

Old carwheels	$10.00 to $10.50
No. 1 cast (machinery)	11.50 to 12.00
No. 2 cast (heavy)	10.25 to 10.75
Stove plate	8.75 to 9.00
Locomotive grate bars	7.50 to 8.00
Malleable cast	8.00 to 8.50

Buffalo

BUFFALO, N. Y., Aug. 3, 1915.

Pig Iron.—A stronger market has developed and orders aggregating about 20,000 tons, all grades, including some malleable and basic, have been placed the past week, all for delivery in the remainder of the year. The price at which producers would be willing to contract for 1916 delivery is apparently not less than $14 at furnace, but very few buyers are as yet interested in purchasing at this figure. Shipments on contracts are going forward from furnaces in large volume, indicating increasing consumption. Some of the furnaces of the district have stiffened their prices and most new quotations are from 25c. to 50c. per ton. higher than made on recent contracts. The higher silicon grades of local producers are being quoted at $14 at furnace. We quote as follows for fourth quarter delivery, f.o.b. furnace, Buffalo:

No. 1 foundry	$13.50 to $13.75
No. 2 X foundry	13.25 to 13.50
No. 2 plain	13.00 to 13.25
No. 3 foundry	13.00
Gray forge	13.00
Malleable	13.25 to 13.50
Basic	13.50 to 14.00
Charcoal, regular brands and analysis	15.75 to 17.25
Charcoal, special brands and analysis	19.00 to 20.00

Old Material.—The market continues active, with a good demand and fairly large transactions in nearly all lines. Heavy melting steel has been particularly active. Prices are unchanged but firm, with an advancing tendency, being as follows, per gross ton:

Heavy melting steel	$11.00 to $11.50
Low phosphorus steel	14.50 to 15.00
No. 1 railroad wrought scrap	10.50 to 11.00
No. 1 railroad and machinery cast	11.00 to 11.50
Old steel axles	13.00 to 13.50
Old iron axles	16.00 to 16.50
Old carwheels	11.50 to 12.00
Railroad malleable	10.50 to 11.00
Machine shop turnings	5.75 to 6.25
Heavy axle turnings	8.50 to 9.00
Clean cast borings	6.75 to 7.00
Old iron rails	11.00 to 11.50
Locomotive grate bars	9.00 to 9.50
Stove plate (net ton)	8.25 to 8.75
Wrought pipe	7.00 to 7.50
Bundled sheet scrap	7.25 to 7.75
No. 1 busheling scrap	8.50 to 9.00
No. 2 busheling scrap	6.50 to 7.00
Bundled tin scrap	9.00

Finished Iron and Steel.—Sellers report the market looking better from day to day, with inquiries coming in in surprisingly large volume. New building enterprises and industrial plant expansion are calling for large quantities of materials in iron and steel lines. Many users of steel products are now anticipating their requirements and placing specifications sufficiently far ahead to insure delivery of material by the time needed, allowing for the increasingly extended mill deliveries to which they are now subjected. The Buffalo office of the Turner Construction Company has secured

contract for a ten-story and basement reinforced concrete addition to a building for the Buffalo Cold Storage Company, requiring about 300 tons of reinforcing bars. The Kellogg Structural Steel Company, this city, has closed contract for 300 tons of structural steel for a high school building at Oil City, Pa.

BRITISH MARKET QUIET

American Independent Companies Out of the Market in Semi-Finished Steel Until 1916

(*By Cable*)

LONDON, ENGLAND, August 4, 1915.

The pig-iron market is very quiet, but traders are disposed to take a moderately hopeful view. In the meantime sentiment is affected by the Russian position and increasing caution is observable. July shipments show an improvement and August figures are expected to maintain the recent expansion, while stocks lately have fallen. Demand for hematite pig iron lacks animation, but makers generally ask 100s. ($24.33), though they might accept a little less. Stocks of pig iron in Connal's stores were 145,067 tons at the end of last week as compared with 144,790 tons one week previous.

Iron ore is stagnant and coke looks easier. There is no business in tin plate. Finished steel is firm with a lessening demand for merchant material owing to pressing national requirements. Leading American independent steel makers are sold out of semi-finished steel until 1916. We quote as follows:

Tin plates, coke, 14 x 20, 112 sheets, 108 lb., f.o.b. Wales, 19s. ($4.62).

Cleveland pig-iron warrants, 66s. ($16.06), as compared with 66s. 4½d. ($16.15) last week.

No. 3 Cleveland pig iron, maker's price, f.o.b. Middlesbrough, 66s. 3d. ($16.12), against 66s. 6d. ($16.18) a week ago.

Steel black sheets, No. 28, export, f.o.b. Liverpool, £11 15s. ($57.18).

Steel ship plates, Scotch, delivered local yards, £9 15s. ($47.44).

Steel rails, export, f.o.b. works port, £8 17s. 6d. ($43.19).

Hematite pig iron, f.o.b. Tees, 100s. ($24.33), against 95s. ($23.12) last week.

Sheet bars (Welsh), delivered at works in Swansea Valley, £7 10s. ($36.49).

Steel joists, 15 in., export, f.o.b. Hull or Grimsby, £10 ($48.66).

Steel bars, export, f.o.b. Clyde, £10 15s. ($52.31).

Ferromanganese, f.o.b., £20 15s. ($100.98).

Ferrosilicon 50 per cent, c.i.f., £15 5s. ($74.21).

Metal Market

NEW YORK, Aug. 4, 1915.

The Week's Prices

Cents Per Pound for Early Delivery

	Copper, New York			Lead		Spelter	
July	Lake	Electrolytic	Tin, New York	New York	St. Louis	New York	St. Louis
28	21.75	18.50	35.75	5.50	5.40	18.25	18.00
29	21.50	18.37½	35.75	5.40	5.30	18.12½	17.87½
30	21.25	18.25	35.00	5.40	5.30	18.12½	17.87½
31	21.00	18.25	....	5.20	5.10	18.00	17.75
August							
2	21.00	18.25	35.00	5.00	4.90	17.75	17.50
3	21.00	18.25	35.50	5.00	4.90	17.50	17.25

Electrolytic copper is lower. Tin is dull and falling. Lead is weak in an inactive market. Spelter is lower and still quiet. Antimony is a little weaker.

New York

Copper.—The market is dead, with electrolytic quoted at 18.25c., New York, yesterday. This is practically nominal though second hand lots are offered, making a level. There is no business though there has been some talk of impending transactions, but it has gone no further. Consumers are merely waiting. In the entire absence of business in Lake copper, the quotation of 21c., New York, yesterday, is only nominal. In general a revival of demand is expected to come sooner or later and sellers are generally willing to meet buyers. The daily press reports of Russian and Italian contracts closed for 50,000 tons of copper for munitions are not confirmed in the market. The exports for July were 17,308 gross tons, or about half of those for July, 1914.

Copper Averages.—The average price of Lake copper for the month of July, based on daily quotations in THE IRON AGE, was 21.98c., and of electrolytic, 19.10c.

Tin.—With July deliveries at 5300 tons, 4700 at the Atlantic seaboard and 600 at the Pacific, consumption for the year is sure to be larger than in 1914. Deliveries last July were only 3900 tons, while for May, June and July this year they total 14,800 tons against 11,250 tons in the same three months of 1914. Stocks on hand Aug. 1 were 991 tons and the total afloat at the close of July was 12,070 tons against 11,166 tons in June, this year, and 5519 tons July 31, 1914. The total visible supply at the close of July was 16,084 tons. The market is decidedly quiet, the quotation being 35.50c. yesterday, New York. Speculation is absent. A few days ago there was some demand for futures but whether any business was placed is doubtful.

Lead.—The easy tone reported last week continues with no improvement in demand; rather the contrary. Resale lots continue to appear and dominate the situation and the difficulty in absorbing these is intensified. Consumers, while continuing to use large amounts, are evidently overstocked. The leading interest reduced its price twice in the last week; on July 30, it dropped its quotation ¼c. per lb. to 5.50c., New York, and again on Aug. 2, ¼c. to 5.25c. In each case outsiders underbid this, going to 5c., which was the quotation yesterday here and about 4.90c., St. Louis. The metal can doubtless be bought under 5c. and a bid of 4.75c., New York, is noted. The exports for July were 2458 tons.

Spelter.—The market is decidedly inactive and is a buyers' market. The nominal prices have continued to decline until yesterday, 17.50c. was the New York quotation for prime Western. Very little has been sold for the last half though dealers are anxious to dispose of their stocks. Spot material is reported hard to secure and brass mill special is variously quoted from 18c. to 23c. Fourth quarter deliveries are selling at 15c. to 16c. The market is now lower than it was when it reacted from the high prices in June of 26½c. The exports for July were only 4483 tons, which are the lowest since last August and only about half those of June.

Antimony.—The market is a little easier and the Chinese and Japanese grades range from 35.25c. to 36.25c., duty paid.

Old Metals.—The market continues lifeless. Dealers' selling prices are unchanged, being nominally as follows:

	Cents per lb.
Copper, heavy and crucible	17.00 to 17.50
Copper, heavy and wire	16.50 to 17.00
Copper, light and bottoms	15.00 to 15.50
Brass, heavy	12.50 to 13.00
Brass, light	9.50 to 10.00
Heavy machine composition	13.50 to 14.00
No. 1 yellow rod brass turnings	13.50 to 14.00
No. 1 red brass or composition turnings	12.00 to 12.50
Lead, heavy	5.00
Lead, tea	4.75
Zinc, scrap	13.00

Chicago

AUG. 2.—Domestic buying shows little or no change and sales are in normal volume, but with some lessening of foreign purchases the market is generally easier. We quote: Casting copper, 18.375c.; Lake copper, 18.75c.; tin, carloads, 35.50c.; small lots, 37.50c.; lead, 5.30c.; spelter, nominally, 17.75c. to 18c.; sheet zinc, nominally, 24c.; Cookson's antimony, 47.50c. to 50c.; other grades, 37c. to 38c. On old metals we quote buying prices for less than carload lots as follows: Copper wire, crucible shapes, 14.50c.; copper bottoms, 13.50c.; copper clips, 14.25c.; red brass, 11.50c.; yellow brass, 11.25c.; lead pipe, 4.25c.; zinc, 10c.; pewter, No. 1, 25c.; tinfoil, 32c.; block tin pipe, 31c.

St. Louis

AUG. 2.—Non-ferrous metals have been quiet and in some reductions have been reported. Lead is quoted at 5.25c.; spelter, 16.50c.; tin, 39c.; Lake copper,

8.75c.; electrolytic copper, 18.50c.; antimony, 40c. The Joplin ore market has been active, with the demand for zinc blende from the smelter interests quite heavy. For 60 per cent ore the range for the week was $85 to $110 per ton, with the top settlement for premium grades at $113. Calamine has been strong at $40 to $50 for 40 per cent, and the top settlement $56. Lead ore has been quiet and rather weak at $60 for 80 per cent. Miscellaneous scrap metals are quoted as follows: Light brass, 7.50c.; heavy yellow brass, 8.50c.; heavy red brass and light copper, 11c.; heavy copper and copper wire, 13c.; zinc, 8c.; lead, 4c.; tea lead, 3.50c.; pewter, 21c.; tinfoil, 30c.

Iron and Industrial Stocks

NEW YORK, Aug. 4, 1915.

The wild speculation in the munitions stocks has been but partly checked by warnings of banks and conservative financial authorities. Some of these stocks again made high records in the past week. A sudden jump has been made in Chicago Pneumatic Tool, with rumors of a possible consolidation. The market in other stocks has been firm, with a rising tendency, indicative of the continued improvement in general business. The range of prices on active iron and industrial stocks from Wednesday of last week to Tuesday of this week has been as follows:

Allis-Chal., com.	23⅝- 38⅞	Pressed St'l, com.	49½- 53
Allis-Chal., pref.	67½- 72¾	Pressed Stl.,pref.	100 -
Am. Can, com.	57⅝- 61½	Ry. Spring, com.	35 - 41⅜
Am. Can, pref.	105½-106½	Republic, com.	37 - 46½
Am. Car & Fdy., com.	56½- 59½	Republic, pref.	94 - 97¼
Am. Loco., com.	52¼- 60	Rumely Co., com.	3 - 6
Am. Loco., pref.	96 - 98	Rumely Co., pref.	8¾- 12⅝
Am. Steel Fdries.	40½- 45	Sloss, com.	39⅝- 44¾
Bald. Loco., com.	77½- 84½	Sloss, pref.	85⅛-
Bald. Loco., pref.	104 -105	Pipe, com.	14 - 16
Beth. Steel, com.	250 -275	U. S. Steel, com.	65¾- 68⅝
Beth. Steel, pref.	130 -139	U. S. Steel, pref.	111 -113
Case (J.I.), pref.	79 -	Va., I. C. & Coke	43 - 49½
Colorado Fuel	36 - 43⅜	Westingh'se Elec.	107¾-113¾
Deere & Co., pref.	92 -	Am. Ship, com.	32 - 48
General Electric.	171 -177¼	Am. Ship, pref.	73 - 79½
Gt. No. Ore Cert.	37⅞- 43⅜	Chic. Pneu. Tool.	69⅜- 93½
Int. Harv. of N. J., com.	98 -106½	Cambria Steel	51 - 52½
Int. Harv. Corp., com.	60 -	Lake Sup. Corp.	8⅜- 10¾
Lackawanna Stl.	49½- 52¾	Pa. Steel, pref.	83 - 85
Nat. En. & St., com.	23½- 27	Warwick	9½-
Nat. En. & St. pref.	88½- 88⅞	Cruc. Steel, com.	51¾- 80
Pittsburgh Steel, pref.	87 - 91	Cruc. Steel, pref.	100 -105
		Harb.-Walk. Ref., com.	55 -
		Harb.-Walk. Ref., pref.	99 -
		LaBelle Iron, com	35 -

Dividends

The Pittsburgh Steel Company, regular quarterly, 1¾ per cent on the preferred stock, payable Sept. 1. This is a resumption of dividend payments after the lapse of a year, having been deferred Aug. 11, 1914.

The Standard Sanitary Mfg. Company, regular quarterly, 1½ per cent on the common and 1¾ per cent on the preferred stock, payable July 27.

The Pressed Steel Car Company, regular quarterly, 1¾ per cent on the preferred stock, payable Aug. 25.

The Pittsburgh Gage & Supply Company, quarterly, ½ of 1 per cent.

The American LaFrance Fire Engine Company, regular quarterly, 1 per cent on the common stock, payable Aug. 16.

The National Lead Company, regular quarterly, 1¾ per cent on the preferred stock, payable Sept. 15, and ¾ of 1 per cent on the common stock, payable Sept. 30.

The Stewart-Warner Speedometer Company, regular quarterly, 1¾ per cent on the preferred and 1½ per cent on the common stock, both payable Aug. 1.

The Youngstown Sheet & Tube Company will continue to maintain offices in the Stambaugh Building, Youngstown, Ohio, for the executive offices and sales departments, after the completion of the new office building at its East Youngstown works. The latter will be used for housing the operating officials and all others connected with the operation of the different plants.

Mesta Pickling Machines in Demand

The Mesta Machine Company, Pittsburgh, has just shipped a four-arm low type sheet pickling machine to the Alan Wood Iron & Steel Company, Philadelphia. This machine is of the improved type with balancing cylinder. Another four-arm low type machine was recently shipped to one of the largest arms manufacturing companies in the United States, to be used for pickling rifle barrels, gun parts and small castings, and is the second unit of the type furnished to this company within the past year. The machine is stated to be pickling as much material in 15 min. as could be pickled by the old method in from 3 to 5 hr. Furthermore, the material is much more thoroughly cleaned, thus eliminating the necessity of the sand blast previously required to insure a clean product.

Two machines of the standard low type are now being built for the Standard Tin Plate Company, Canonsburg, Pa., which has had two Mesta pickling units in operation for some years. Orders have also been received from the McKeesport Tin Plate Company for three additional low type pickling machines for its new plant at McKeesport, Pa. When these new units are installed this company will have a total of six Mesta pickling machines in its plant, three having been in operation for several years. Hundreds of these machines are now in operation throughout the United States, pickling sheets, pipe, strip steel, gun parts, automobile parts, wire coils, castings and various other products of iron, steel, brass and copper.

New Installations of Heroult Electric Furnaces

The installation of a new three-ton Heroult electric steel furnace has been licensed by the United States Steel Corporation at the plant of Armstrong-Whitworth Company, Ltd., Longueuil, near Montreal, Canada.

The recent contract for a 15-ton Heroult electric furnace for the United Steel Company, Canton, Ohio, mentioned in THE IRON AGE of July 22, 1915, supplementing the 6-ton Heroult furnace already in operation there, will employ a current of 3000 kw. The other two 15-ton Heroult furnaces operating in the United States employ only 2250 kw. The increase will enable a greater application of heat to cold metal and a quicker production.

The 6-ton Heroult furnace at the Indiana Harbor plant of the American Steel Foundries was successfully put in operation in the week of July 18.

First National Exposition of Chemical Industries

The National Exposition of Chemical Industries will be held at the Grand Central Palace, New York City, in the week of Sept. 20. This is the first comprehensive effort of the kind in this country, though many such expositions have been held in Europe with highly beneficial results. The scope of the exhibits will be broad and the iron and steel industry will be represented.

Building Construction in the United States

Official building permits, issued by the leading American cities, for the first six months of this year, as compiled by the *American Contractor*, amounted to $318,179,519, a decrease of $32,684,347, or only 9 per cent as compared with the same period in 1914. Indications point to the deficit being neutralized and perhaps exceeded in the last half of this year.

The Pennsylvania Railroad's car repair shops at Altoona, Hollidaysburg, Bellwood and Huntingdon, Pa., have been ordered to operate on a schedule of fifty-five hours a week instead of forty-four, the schedule which has been in force since 1913.

The Erie Malleable Iron Company, Erie, Pa., has let contracts for an annealing room to be added to the foundry, 126 x 278 ft.

OBITUARY

ALEXANDER MILNE, senior member of the firm of A. Milne & Co., iron and steel merchants, New York, Boston and Chicago, died Aug. 1 at his home at White Plains, N. Y., aged eighty-three years. He was born in Montrose, Scotland. Removing to Sheffield, England, when about nineteen, he entered the employ of Henry Roessel & Co., steel manufacturers, and later became connected with Vickers, Sons & Co., Ltd., who in 1869 sent him to this country to promote the sale of their steel in America. Two years later he engaged with Naylor & Co., and became a member of the firm in 1883. While with this firm he took an active part in the management of the Norway Steel & Iron Company, South Boston, Mass., his practical knowledge of the steel manufacture acquired in Sheffield proving of much value in the development of its business. In 1887 he withdrew from Naylor & Co., and established the firm of A. Milne & Co., representing Alrutz & Co. and their successors, C. & J. Svedberg of London and Stockholm. He became widely known in the iron and steel trade of this country, continuing in active business up to the time of his death. He was an expert golf player, was at one time president of the Scarsdale Golf Club, and at the time of his death was a governor of the club. He took a deep interest in religious and charitable matters and was the first president of the White Plains Y. M. C. A. He leaves his widow, a daughter and a son, Alexander Milne, Jr.

GEORGE L. DAMON, widely known as a manufacturer of steel safes for banks and office buildings, died at Hull, Mass., July 31, aged seventy-four years. He was born at Stoughton, Mass., and after being educated at Stoughton and East Boston, entered the employ of Harrison Loring, operating a shipbuilding yard at South Boston, later taking up the same line of work in Portland, Me., as mechanical engineer. He began the manufacture of safes in partnership with James Wilson at Boston in 1866 as a result of the Portland fire of that year, purchasing the plant of the Tremont Safe Company. In about three years Mr. Damon's former employers at Portland again secured his services, but his reputation as a mechanical engineer and designer soon led to his appointment as head of the mechanical department of the American Safe Company. In his new work he patented several locks and in 1874 purchased the entire plant from his employers. The products of his establishment have since been installed in many important buildings and financial institutions. Mr. Damon was also proprietor of the Harvard Dry Plate Company, Cambridge, Mass., was a trustee of the Home Savings Bank, Boston, and at one time served in the Boston Common Council.

JOHN PARKER, eminent as a designer of machinery, died at Providence, R. I., July 23, aged fifty-one years. He was born in England and came to this country in 1887. After four years' service in the drafting department of the Corliss Steam Engine Company, Providence, he entered the employ of the Brown & Sharpe Mfg. Company, and from 1893 until his death he was the engineer in charge of designing milling machines, but was also called upon to design machines for nearly every line of work carried on by the company, acquiring a high reputation for turning out machine tools of precision. Mr. Parker's greatest achievement was in developing the constant speed drive milling machine and adapting this method of driving to a complete line of machines built by the company. He was a member of the American Society of Mechanical Engineers. He leaves his widow, a son and a daughter.

W. C. MOORE, vice-president, Wrought Iron Range Company, St. Louis, Mo., died suddenly from apoplexy at a birthday dinner given him July 29 by his associates in honor of his seventy-second birthday. His death also came on the forty-fourth anniversary of his connection with the company. He had for six years made his headquarters at Knoxville, Tenn., but was in St. Louis at a meeting when death came. He leaves his widow and a daughter.

HENRY J. WALDORF, Kewanee, Ill., died July 24, aged fifty-two years. He was born in Chicago, receiving his education in the local public schools. His first employment was by the Crane Company in its malleable foundry department. In 1892 he took the position of foreman of the annealing department of the Western Tube Company, Kewanee, continuing until 1902, when he took charge of the radiator foundry of the Kewanee Boiler Company, returning in 1904 to the employ of the Crane Company, being for a time foundry superintendent of its Bridgeport plant. In 1906 he returned to Kewanee, where he had since been employed by the National Tube Company in its Kewanee works, as foundry expert, having entire charge of pattern making and acting in an advisory capacity to all the foundries. He leaves his widow and seven children.

GEORGE E. ROGERS, vice-president and general manager, Millers Falls Company, Greenfield, Mass., died July 29, aged sixty-six years. He had been in failing health for a long time. He was born in North Adams, Mass., and received his early education in the schools of that place and in Boston. While a young man he engaged in business with his father at Northampton, but for the past forty years had been connected with the Millers Falls Company, besides being interested in the firm of Rogers, Lunt & Bowler, silversmiths, and other industrial enterprises. He was for a long while an officer of several financial institutions, but his health obliged him to give up his active connection with banks some time ago. He leaves his widow, a daughter and one son, Philip.

GEORGE HENRY LLOYD, Roxbury, Mass., for many years prominent in the iron and steel trade of New England, died July 23, aged 82 years. He was a native of Boston and his first employment was with the mercantile agency of Russell & Co. in that city, following which he became a clerk for Tuckerman & Cate, later the firm of Isaac M. Cate. In March, 1879, Mr. Cate retired and Mr. Lloyd succeeded to the business, which he continued with the help of his four sons. He leaves his widow, four sons and three daughters.

FRANCIS J. ROBINSON, superintendent of the plant of R. Estabrook's Sons, South Boston, Mass., died July 24 of shock following an operation, aged sixty-three years. He was a native of Boston and entered the iron business at an early age. He leaves his widow and four children.

Radium Successfully Made Cheaper

The successful manufacture of radium from Colorado carnotite ores by the United States Bureau of Mines was announced July 28 by Secretary of the Interior F. H. Lane. The work, done in connection with the National Radium Institute, has passed the experimental stage in its new process and is now on a successful manufacturing basis. Mr. Lane also declared that the statement made to Congress as to the ability of the Bureau of Mines to produce radium at a greatly decreased cost over other processes had actually been accomplished and that the costs were even less than predicted. He added: The cost of one gram of radium metal as the bromide in March, April and May this year was $36,050. This includes cost of ore, insurance, repairs, etc. Radium bromide was selling at $120,000 to $160,000 a gram. The public, however, should not infer that this low cost of production necessarily means an immediate drop in the selling price. The National Radium Institute was fortunate in securing through the Crucible Steel Company the right to mine ten claims of carnotite ores belonging to it, and this was practically the only ore available then.

The Ball Engine Works, Twelfth Street, Erie, Pa., is taking bids for a boiler-house addition.

PERSONAL

Thomas J. Reay, president Republic Iron & Steel Company, Youngstown, Ohio, has returned from a week's trip of inspection of the company's ore mines in Minnesota.

Charles M. Manly, vice-president Manly Drive Company, New York City, manufacturing a hydraulic power transmission, is at present engaged at Toronto, Ont., with the Curtiss Aeroplane & Motor Company, Ltd.

Harry Coulby, president and general manager, Pittsburgh Steamship Company, was seriously injured in an automobile accident Aug. 2, near Cleveland, Ohio.

Franklin B. Macomber has disposed of his interest in the Macomber & Whyte Rope Company, Chicago, to George S. Whyte and has accepted the appointment of general manager of the Franklin Life Insurance Company for northern Illinois, with offices in Chicago.

J. C. Davis, fourth vice-president, American Steel Foundries, Chicago, sailed for England July 24.

Lieut. Oliver Dwight Filley of the Royal Flying Corps of the British army has received the military Cross for conspicuous gallantry. While aloft he repulsed two attacks by hostile aeroplanes and retired only after two such aeroplanes had charged him at once, his observer had been killed at his side, his engine was crippled and he had exhausted his last round of ammunition. He belongs to a St. Louis family which is among the oldest in the Western iron trade.

J. M. Jolly of the Australian Metal Company, Melbourne, has arrived in this country, according to San Francisco advices, on his way to England. It is announced that while in the Eastern States he intends to order equipment for a large plant to be built in Melbourne.

J. M. Stutter, at one time connected with the Republic Iron & Steel Company, Youngstown, Ohio, has been appointed superintendent of the bolt works of that company at Muncie, Ind. He has recently been engaged in business at Cincinnati.

L. H. Underwood, formerly in charge of the by-product coke works of the Indiana Steel Company, Gary, Ind., is now superintending the erection of the Koppers by-product coke plant for the Youngstown Sheet & Tube Company, East Youngstown, Ohio.

E. R. Ayles, treasurer of the Trussed Concrete Steel Company, Youngstown, Ohio, has resigned, and has been succeeded by A. W. Chaffee of Detroit, Mich.

H. E. Barrett has returned to the position of manager of sales for the ice machine department of the Henry Vogt Machine Company, Louisville, Ky. Guy Ellis, who has been in charge of this work for the past two years, has been put at the head of a new department devoted to the foundry, fittings and forgings business of the company.

W. VanAusdall, electrical engineer, Cincinnati, Ohio, has been appointed superintendent of the C & C Electric & Mfg. Company, Garwood, N. J., and assumed his new duties Aug. 2.

R. E. Harris, president of the Nova Scotia Steel & Coal Company, having been appointed to the bench of the Nova Scotia Supreme Court, Vice-President Thomas Cantley of Halifax becomes president. Lieut.-Gov. J. D. McGregor of Nova Scotia and D. W. Ross of Toronto become vice-presidents.

D. P. Thompson and H. C. Jones, both of Chicago, have been elected directors of the Inland Steel Company, succeeding F. W. Olin, resigned, and Joseph Block, deceased. The officers were re-elected.

The American Steel & Wire Company, which will build a large plant at Donora, Pa., to make spelter, has appointed N. L. Heinz consulting engineer in connection with the work. Mr. Heinz largely designed and assisted in the construction of the spelter plant built last year by the American Zinc & Chemical Company at Langeloth, Pa., an illustrated description of which appeared in THE IRON AGE of May 13, 1915.

William E. Moore, vice-president and general manager, West Penn Traction Company, with which he has been affiliated since 1903, has resigned to establish a consulting engineering business in Pittsburgh.

C. D. Wheeler, advertising manager of the Fort Wayne electric works of the General Electric Company for the past six years, resigned his position July 17 to go with the Santo Mfg. Company, Philadelphia, Pa., as advertising and assistant sales manager. This company manufactures electric vacuum cleaners.

Maynard D. Church, recently chief engineer of the Dayton Turbine Pump Company, Cleveland, Ohio, has been appointed assistant engineer of the Terry Steam Turbine Company, Hartford, Conn.

Dr. William B. Phillips, who for a number of years has been in charge of the Bureau of Economic Geology and Technology of the University of Texas, Austin, Tex., has been elected president of the Colorado State School of Mines at Golden, Col. He will take up his new duties Sept. 1 and may be addressed at Golden after Aug. 15.

Major E. Herrera, chief of the Spanish Royal flying service, and Major Garrido, S. R. A., members of the Army and Navy Commission recently appointed by Spain, and now in this country to investigate and purchase supplies, accompanied by Henry S. Moos, purchasing agent for the Spanish Government, visited the Edison Storage Battery Company, Orange, N. J., on July 23. The party was conducted by H. L. Barnitz of the International Oxygen Company, and was taken through the works by R. A. Bachmann, vice-president of the Edison company, and M. R. Hutchison, the personal representative of Mr. Edison.

Alfred C. Brown, general supervisor of equipment, Edison Lamp Works of the General Electric Company, Harrison, N. J., has been made works manager with the Hopkins & Allen Arms Company, Norwich, Conn.

Tungsten and Chrome Ores Scarce

A recent sale of tungsten ore, 72 per cent, is reported to have been made in this country at $16 per unit, Atlantic seaboard, but further supplies are very hard to obtain. The quotation in London, England, for the 70 per cent ore was £3 ($14.59) on July 16, which is an advance over the price one week previous of $1.09 per unit. Ferrotungsten, or the powdered metal, which was 60c. to 70c. per lb. of contained tungsten before the war, is now, as for several weeks, about $2.50 per lb., while the London quotation on July 16 was 7s. to 7s. 6d. ($1.70 to $1.82) per lb. for the powdered metal, 96 to 98 per cent pure, and 6s. 6d. to 6s. 9d. ($1.58 to $1.64) per lb. of tungsten in the 80 to 90 per cent ferroalloy.

Chrome ore is said to have been recently imported into this country from New Caledonia at $28 for the 50 to 55 per cent grade. The London price on July 16 was £5 15s. ($27.98) for the New Caledonia and Baluchistan 50 per cent ores, and £5 10s. ($26.76) for the Rhodesian ore, 48 to 52 per cent.

The output of Spanish antimony, according to Consul General Carl B. Hurst of Barcelona, Spain, could be multiplied greatly, as only a few of the many antimony mines in the Barcelona district are fully exploited. There is but one antimony smelting plant there, the output of which is insufficient to meet orders from the United States.

The LaCrosse Scrap Iron & Metal Company, LaCrosse, Wis., whose business was established in 1893, was incorporated in the present year and the management reorganized. The company handles scrap iron and second-hand materials of all kinds as well as new and old metals. It has plans for equipping its yards with modern machinery.

Opposition to Government Defense Plans

The Attitude of Congress—Proposal to Contract with Private Plants as Well as Enlarge Arsenals—Meeting Present Labor Problems

WASHINGTON, D. C., Aug. 3, 1915.

The developments of the past week have demonstrated beyond question that the Administration has before it a hard fight to induce Congress to provide funds to carry out President Wilson's plan to place the country in a "sane, reasonable and practical state of national defense." While the President will undoubtedly have the active co-operation of some of the most experienced and influential leaders on both sides of the House and Senate, he will unquestionably have arrayed against him a coterie of the men in both houses who have been most active in framing the appropriation bills for the naval and military service during recent years. In addition, he will be obliged to meet the organized work of certain peace advocates, led by ex-Secretary of State William J. Bryan, who has already given notice that he will reside in Washington during the coming winter and will lend his influence to the movement in opposition to any material expansion in our military establishment. Mr. Bryan is also enlisted in the cause which has for its object the placing of a ban on exportations of war material and will make this prohibition a feature of his campaign.

Secretary of War Garrison is pushing with great vigor the work of preparing his project for the enlargement of the army and the development of the capacity of both public and private plants for the production of war munitions. The Secretary of War is fully entitled to the credit he is receiving as the originator of President Wilson's new program for the national defense. For months he urged this project upon the President's attention and upon that of his colleagues in the Cabinet, and for a long time he stood alone. Secretary Bryan, his chief opponent, was seconded in his opposition by Secretary Daniels, but the latter, who has a sharp eye and a keen ear for manifestations of public sentiment, parted company with Mr. Bryan when the latter left the Cabinet and has since swung squarely into line with the Secretary of War. To-day the Cabinet is a unit for the President's "sane, reasonable and practical" program, and the entire influence of the Administration will be exerted upon Congress to provide the funds necessary for its execution.

Government Work and Private Work

A significant, not to say an ominous, statement has just been given to the press by Representative James Hay of Virginia, chairman of the House Committee on Military Affairs in the last Congress, and almost certain, in view of Congressional precedents, to be reappointed to that post in the coming session. Mr. Hay declares that while he is in favor of providing reasonable appropriations for the maintenance of the army, he does not intend to be stampeded into extravagance. It does not take an expert in Congressional proceedings to read between the lines of Mr. Hay's statement. He has already been cataloged by administration officials as a "little army" man, and unless he is driven from his present post by the overwhelming public sentiment which seems now to be gathering in all sections he must be reckoned with as an active and experienced opponent of the Administration's new policy. Mr. Hay is counted upon especially to oppose the War Department's policy which contemplates enlarging the capacity of the arsenals, while limiting their actual production to a minimum adequate to the maintenance of their efficiency, the bulk of the Government's requirements in the way of munitions to be provided by contract with private manufacturers, who would thus be induced to keep their plants in running order. Mr. Hay has always insisted that the arsenals should be utilized for the manufacture of war munitions up to the limit of the Government's requirements, especially in view of the fact that the cost of production by the Government can be figured as less than that of private manufacturers, provided no account is taken of capital invested, overhead charges, etc. It is the hope of the War Department officials, however, that the present emergency will serve to clear away all the fallacies that have been put forward against the development of General Crozier's long cherished plans and that adequate appropriations will be made for putting the Ordnance Bureau on a thoroughly up-to-date business basis.

The National Peace Council's Work

The first gun in the campaign against the further exportation of munitions of war was fired here on Aug. 1, when at a meeting summoned by the so-called National Peace Council an attempt was made to pass a resolution recommending to Congress "the passage of a law authorizing the Government to take over the manufacture and sale of all instruments and munitions of war." The principal speaker at this meeting was Hannis Taylor, at one time United States Minister to Spain, and a recognized authority on certain phases of international law. Mr. Taylor urged that Congress should levy an embargo on all munitions of war going to the allies "unless Great Britain guarantees to the food products of the West and the cotton products of the South all the rights to which they are entitled on the high seas." While Mr. Taylor's address was received with marked favor, the convention balked at the resolution authorizing the Government to take over the manufacture and sale of war material and it was finally withdrawn without the formality of a vote. There can be no doubt, however, that this measure, which was the subject of considerable discussion during the recent session of Congress, will be revived when the Senate and House reconvene and will be urged as a feature of the anti-administration program.

Advances to Arsenal Employees

The War Department is endeavoring to forestall any dissatisfaction that may result among employees of the arsenals because of the substantial increases in pay which have been granted to machinists and other workmen in private plants having war contracts. All the skilled workers in the Government establishments will receive the same wages as are paid by private concerns in the vicinity. Advances in pay at the arsenals have already been directed and a general inquiry is now on foot to ascertain the prevailing rate of machinists' wages at various private plants. At Frankford three committees, representing the three departments of the arsenal, are in charge of the investigation, each of which is composed of a man selected by the employees and one designated by the commanding officer. Skilled workmen as a class prefer the Government service, and as the War Department is preparing to meet the emergency wage scales now in

e it is not believed that private manufacturers will able to entice many of the arsenal employees to e their jobs.

Six Cruiser Destroyers

The first important effect upon our naval policy the European war is seen in the plans for six big iser destroyers authorized by the last Congress, ch have just been approved. According to an official ement, a large amount of naval information re-ed by experts sent abroad at the beginning of the was closely scrutinized by the constructors before plans were drawn. The vessels will have a maxi-n sustained speed of 30 knots; they will displace 6 tons, measure 310 ft. over all, have a width of ft. 7 in. and a mean draft of 8 ft. Provision has made in the design to decrease rolling and pitch-at sea, making the boats more comfortable for r crews. Each destroyer will carry four triple edo tubes, a main battery of four 4-in. guns, those the waist mounted high enough to increase their iency in rough weather, and two 1-pounder anti-craft guns. Bids for construction will be opened 6.

W. L. C.

Pittsburgh and Nearby Districts

The annual meeting of stockholders of the Youngs-n Iron & Steel Company was held in Youngstown on sday, Aug. 3, and a trip of inspection was made to new open-hearth steel plant now being built at ellville, Ohio, about ten miles distant. The first heat teel was poured in one of the new open-hearth fur-s, which are about complete, but the blooming and et-bar mills will not be finished for a month or more.

Charles T. Johnston, general sales manager, Repub-Iron & Steel Company, announces that the Buffalo Detroit branch offices of that company will be sep-te districts, effective from Aug. 1. M. E. Gray is s manager at Buffalo, and C. S. Powers at Detroit.

The bi-monthly examination of the sales sheets of Brier Hill Steel Company, National Stamping & ameling Company, Newport Rolling Mill Company, Whitaker-Glessner Company, made in Pittsburgh y 30, developed that the selling prices of Nos. 26, 27 28 gage Bessemer black sheets for May and June not warrant any increase in wages of sheet-mill kers in July and August.

The Phillips Sheet & Tin Plate Company will add hot tin mills to its tin-plate plant at Weirton, W. , and will also probably make some large additions its cold-rolled steel plant at the same place.

The Valley Mold & Iron Company, Sharpsville, Pa., starting extensive enlargements to its foundry that practically double its capacity. It is essential, in er to safeguard customers, that the company should e a large surplus capacity to meet unexpected de-nds for molds, and the present increase is for that pose. It is hoped to have this extension completed about four months. Frank W. Tickner has been moted to the position of general manager and Ed-rd H. Boyd takes his place as general superintend-of the company.

The Homestead Valve Mfg. Company, Homestead, , has increased its capital stock from $50,000 to 0,000, and it is stated will make some slight additions its plant.

The Ford Motor Company, which will double the pacity of its assembling plant in Pittsburgh, is in the rket for a number of tools to be installed in the dition.

The offices of the Abramsen Engineering Company ve been removed from room 1914 to room 810, Union nk Building, Pittsburgh.

The Pittsburgh office of the Babcock & Wilcox Boiler mpany has received an order from the Youngstown eet & Tube Company, Youngstown, Ohio, for five 4-hp. Babcock & Wilcox horizontal water-tube boilers, 4000 hp. in all, to furnish steam for the new bar mills and the new electric plant to be erected by the latter company at East Youngstown. The same office has received an order from the city of Cleveland for five 500-hp. Stirling water-tube boilers to be installed in the new water works to be built by that city.

The Erie Foundry Company, Erie, Pa., builder of steam hammers, tin-plate and sheet-mill equipment, etc., is operating its plants night and day, and has a very large volume of business booked.

The Hammond Iron Works, Warren, Pa., builder of steel tanks and steel plate construction of all kinds, recently made a shipment of fifty-six carloads of steel plates to points in Mexico. The train left Warren at 9.30 on a recent Saturday morning and arrived in New York on the following Monday morning at 11.30. The train was hauled by three engines on the New York Central lines and the total weight was about 6,000,000 lb. The plates will be used in building nine tanks, 35 ft. 4 in. high and 114 ft. 6 in. in diameter, to be used for storing oil. They will be erected in the Tampico oil district in Mexico, where the Hammond Iron Works has already built several large oil refineries.

The William B. Scaife & Sons Company, Pittsburgh, has received a contract from the Paulton Coal Company, West Apollo, Pa., for the erection of a large steel frame tipple to replace one recently destroyed by fire.

The Galion Iron Works & Mfg. Company, Galion, Ohio, manufacturer of culvert pipe and road machinery, has added a new electric power plant to the factory equipment, which consists of a 150-hp. Bruce-Macbeth 4-cylinder vertical gas engine and generator. Plans are being completed for an addition to its foundry, 60 x 64 ft., to be built of steel, glass and concrete. The company states that it is enjoying a large business this year. The demand for road-making machinery and culvert pipe is increasing constantly.

The Ward Nail Company, Niles, Ohio, is taking out some of the single wire-nail machines in its plant, and replacing them with double machines. Some new double machines will also be installed, largely increasing the capacity, and giving the company a greater range in sizes.

The Kenova Mine Car Company, Huntington, W. Va., is a new incorporation, with $100,000 capital stock, to manufacture mine cars. The vacant plant of the Independent Steel Company of America at Huntington has been acquired, and will be fitted up at an early date. Thomas F. Baily, Jr., and Frank B. Enslow are named among the incorporators of the new company.

At Charleston last week the West Virginia Public Service Commission rescinded its order of some time ago, suspending railroad tariffs on blast-furnace and steel-mill refuse, thus permitting the carriers to put into effect a tariff imposing 20c. per ton on these materials. The commission took the position that the petition of shippers against the tariff had been filed too late, and hence the proposed rates must stand.

The Harris-Smith Coal & Coke Company has removed its general office from Uniontown, Pa., to the First National Bank Building, Pittsburgh. The shipping offices will be retained at Uniontown. O. E. Lafleur, formerly with the Berwind-White Coal Mining Company, now has charge of the coal department.

The Standard Smelting Company, Pittsburgh, has been incorporated in Delaware by H. S. Glen and others with a capital stock of $100,000 to smelt, reduce and extract mineral bearing ores.

Orders recently taken by the Thomas Carlin's Sons Company, Pittsburgh, include a 20 x 12-in. crusher for the Pittsburgh Steel Company, Monessen, Pa., two 9 x 10-in. three-drum hoisting engines, with feed pumps, for the United States engineers' office, Pittsburgh, and several large shears, crushers and wet pans for delivery to points in New York, eastern Pennsylvania, Texas and Ohio.

The Carnegie Steel Company has purchased several tracts of land on the Susquehanna River, near Florin, Lancaster County, Pa., and will quarry dolomite and other limestone.

MACHINERY TRADE RUSHED

Demand Increases, with Delivery Remote

Frantic Efforts to Secure Deliveries—Westinghouse Takes Another Rifle Contract—Lehigh & New England Railroad Buying

Every phase of the metal working industries is feeling an extraordinary stimulation. Not only are machine-tool makers working 24 hr. at full capacity and jobbing out all possible work, but they are now allowing their customers who have necessary equipment to manufacture machines that they need. This was clearly brought out by a mechanical engineer from Europe, who states that one company has manufactured 125 lathes in this way. There is a sort of stampede on the part of manufacturers to get whatever tools they can lay their hands on. Manufacturers, especially those who have an opportunity to profit from war orders, are now almost frantic in their efforts to get deliveries of machine tools. A plea for just one tool right away with others to follow in a couple of months is finally adjusted by the buyer eagerly grasping the promise of one within six months. In spite of every discouragement more buyers are coming into the market every day.

The Lehigh & New England Railroad has issued a revised list of twenty-seven tools and new crane specifications for its Pen Argyl shops. The Baldwin Locomotive Works will close contracts in a few days for what is estimated at about $2,000,000 worth of machinery. The Fore River Ship Building Corporation, Quincy, Mass., and the William Cramp & Sons Ship & Engine Building Company, Philadelphia, are overhauling and enlarging their plants, the former now erecting a ship tool shop to cost about $400,000. Both are now buying a good list of equipment. The Baltimore Car & Foundry Company, Pittsburgh, Pa., will build an addition to its plant at Curtiss Bay, Md., to cost about $500,000, and will equip it for structural and bridge work, including seven 20-ton and twelve 7½-ton cranes.

The Seaboard Air Line is buying from its recent specifications. The Reeves-Cubberley Engine Company, Trenton, N. J., is inquiring for twenty turret lathes. Springfield, Ohio, will open bids Aug. 23 for nine lathes, a 20-in. shaping machine, a dry emery grinder and a sensitive drill press, and Schenectady, N. Y., is buying a 10-ton hand power crane. The American Bronze Company, Berwyn, Pa., will purchase a hand screw machine. In Canada, Alexander Chaplin will take over the Defiance Iron Works, Windsor, Ont., and install $20,000 worth of machinery to make shells. The Canadian Western Foundry & Supply Company, Calgary, Alberta, will also take up the manufacture of them, and the St. Thomas Construction Company, St. Thomas, Ont., is reported in the market for shrapnel-making machinery.

The International Steam Pump Company has purchased about 258 lathes and forty screw machines. Recent purchases by the Baldwin Locomotive Works include fifty turret lathes. The W. P. Davis Machine Company recently bought $15,000 worth of tools. The Pennsylvania Lines has been buying one or two machines a week and it is now apparent that nearly all manufacturers of machinery have been gradually increasing their equipment.

The Westinghouse Electric & Mfg. Company h taken another contract from Russia. It calls for $ 000 rifles with an option on 200,000 more. The va of the order will exceed $25,000,000. It is probab that the New England Westinghouse Company, Spri field, Mass., will do the work. The Hero Mfg. Compa Philadelphia, has a time fuse contract worth $500, and is looking for tools, presumably for handling Fayette R. Plumb, Inc., Philadelphia, is reported have received an order from J. P. Morgan & Co. 50,000 bayonets to cost approximately $100,000. New Britain, Conn., war contracts are estimated brie The Corbin Screw Corporation, sub-contract for shra nel parts, $90,000; the North & Judd Mfg. Compa shrapnel parts, $500,000, and the Traut & Hine M Company, three orders for brass fasteners for leggin totaling 120,000 gross. The Gramm-Bernstein Co pany, Lima, Ohio, has received an order for 5000 4-t motor trucks for foreign shipment, and has award contract for an addition 50 x 200 ft. The Marble Ar & Mfg. Company, Gladstone, Mich., has been award contract by Russia for 400,000 rifle sights. The Ba lett-Hayward Company, Baltimore, is erecting machine shop, boiler and forge shops to cost $168,0 to take care of its shell business.

New York

NEW YORK, N. Y., Aug. 4, 1915.

Conditions in the machine-tool market are such as ne have been seen before. Business is accelerating at a r which the most experienced man in the trade cannot rea Perhaps the only class of buyers not in the market in good as normal demand are the railroads. They continue be the reluctant buyers; but machinery houses look up this condition with great satisfaction, inasmuch as th must come into the market eventually and so will serve keep up demand when the present abnormal rush is ov The fact that railroads buy only new tools makes matte even better. The Pennsylvania Lines are inquiring for u buying one or two tools a week right along, and other ra roads buy in somewhat the same way.

The Lehigh & New England Railroad has issued a l of machine tools for its new shops at Pen Argyl, Pa. T machinery is to be individually motor driven. Bids are be received within a few days and delivery by Oct. 1 asked. Edwin Hughes, 437 Chestnut Street, Philadelph Pa., is purchasing agent. It has also sent out a revised l of its crane requirements. The specifications for machi tools call for:

One 20-in. x 10-ft. standard engine lathe with taper a tachment

One 16-in. x 6-ft. standard tool room lathe with tap attachment

One ¾-in. universal hollow hexagon turret lathe for ba and chucking work

One 36-in. x 18-ft. standard engine lathe

One 42-in. standard boring mill, no boring bar includ equipped with universal chuck for boring carwheels

One No. 3 high-power universal milling machine

One No. 5 tool grinding machine

One No. 1½ universal cutter and tool grinder and a tachments

One drill grinder

One 2-ft. plain radial drill

One 5-ft. radial drill

One 28-in. upright drill

One 100-ton hydraulic bushing press

One 600-ton wheel press

One 36-in. x 36-in. x 10 ft. standard pattern plani machine

One double end punch and shear, with cross-cutting a tachment for shearing bar iron, to punch 1¼ in. in diamet through 1-in. mild steel or to shear 1-in. plate

One plate bending rolls

One 4-in. centering machine

One small hammer or spring banding furnace

One flue welding furnace
One No. 4 forging furnace
One flue welding machine to weld 2-in. tubes and 5⅝-in. superheat tubes
One 2000-lb. single frame guided ram steam hammer
One 3-in. bolt heading, upsetting and forging machine
One 1-in. to 6-in. pipe threading machine
One 2-in. single head bolt cutter
One set of flanging clamps, 16 ft. between housings.

The Fore River Ship Building Corporation, Quincy, Mass., is buying equipment for its ship tool shop now under construction, and the William Cramp & Sons Ship & Engine Building Company, Philadelphia, will be in the market shortly for machine tools for the new shops it is building. The Alpha Portland Cement Company, Easton, Pa., is inquiring for a crane.

The International Steam Pump Company has purchased about 258 lathes and 40 screw machines, to be used for munitions work. The Reeves-Cubberly Engine Company, Trenton, N. J., is inquiring for 20 turret lathes. Many companies are inquiring for long lists of tools, but most have to be satisfied with the delivery of one or two machines. As many companies realize the practical impossibility of getting large quantities of equipment and are therefore ordering single tools, the amount of such business is considerable.

An interesting feature of the long delivery situation in the machine-tool industry is mentioned by a prominent European engineer who at present is in this country looking after orders placed by his company. He states that foreign manufacturers are greatly dissatisfied with the deliveries and, in some cases, with the prices asked by American machine-tool builders, and in a number of instances are building machines for their own use, one firm having turned out 125 lathes. In this country a prominent builder of pumps is using the facilities of one of his plants to construct a number of milling machines for his own use.

F. J. MacDonald, Warnerville, N. Y., plans to engage in the business of building straw and dust blowers for threshing machines. He is in the market for tinners' tools, either new or second-hand, including a pair of large bench shears, seaming machine and pipe roller.

The Turner Construction Company, 11 Broadway, New York City, has been awarded the contract for the construction of a seven-story addition, 100 x 160 ft., to the factory of J. Schrader's Son, manufacturer of diving equipment, Vanderbilt and Atlantic Avenues, Brooklyn, N. Y.

Gooley & Edlund, Inc., manufacturer of milling machines, Cortland, N. Y., has doubled its equipment and output since Jan. 1, and is erecting a duplicate of its present factory to be completed by Aug. 15. It has not yet taken up the question of increasing its tool equipment.

The Brunner Mfg. Company, manufacturer of air compressors, etc., Utica, N. Y., is erecting an additional building of irregular dimensions, containing a main machinery bay, 75 x 188 ft., and an office wing, 46 x 49 ft., of concrete and metal sash construction. Shipping facilities will extend the entire front of the building, which will be used exclusively for the manufacture of its small air compressors. It is to be equipped with the latest type of machinery available. George L. Brunner is treasurer and general manager.

The Turner Construction Company, 11 Broadway, New York, has been awarded contract by the Sperry Gyroscope Company for the erection of an eleven-story reinforced concrete factory, 100 x 134 x 177 ft., to be erected at Flatbush Avenue and Concord Street, Brooklyn, N. Y., Frank J. Helmle, 190 Montague Street, Brooklyn, is the architect.

The Empire Axle Company, Dunkirk, N. Y., plans either to acquire a building to enlarge its manufacturing capacity or to erect one. William C. Blackham is secretary.

The Bossert Company, Utica, N. Y., advises that it has just completed a one-story addition to its trimming department, 25 x 100 ft., and is adding to its acetylene welding department a structure 20 x 90 ft., and to its press room an addition 20 x 100 ft., all one-story. It was incorrectly stated in THE IRON AGE that the company's name was the Bossert Mfg. Company and that it was erecting a two-story addition to its nickel-plating department.

John T. Rowland, 100 Sip Avenue, Jersey City, N. J., has completed plans for a three-story garage, repair shop and storage building to be erected by the city of Jersey City at a cost of about $50,000.

The W. P. Davis Machine Company, Rochester, N. Y., manufacturer of lathes, etc., has increased its equipment by the purchase of about $15,000 worth of tools. It is now concentrating on the manufacture of its cutting-off machines and turret lathes.

The Zeh & Hahnemann Company, Avenue A and Vanderpool Street, Newark, N. J., manufacturer of sheet metal working machinery, etc., has recently taken up the manufacture of a patented percussion power press for the manufacture of hot pressed brass parts, and is working at full capacity on it. It is contemplating an increase in its factory place for which equipment will be required.

The Watson-Stillman Company, manufacturer of hydraulic machinery, Aldene, N. J., is increasing its main machine shop from 180 ft. to 240 ft. It has purchased several machine tools and has increased its output about 40 per cent above normal by operating the majority of its larger tools day and night and running the entire shop until 9 p. m.

The Chevrolet Automobile Company will soon be ready for bids for construction of a two-story factory to be built at Tarrytown, N. Y., at an estimated cost of $40,000. W. C. Durant, 816 Eleventh Avenue, New York City, is president.

The Rochester Welding Works, 406 Orchard Street, Rochester, N. Y., has let general contract for a factory to be erected at once.

The Houk Mfg. Company, Buffalo, manufacturer of wire spoke wheels for automobiles, has completed plans for an addition to its plant at Elmwood Avenue and the New York Central Railroad Belt Line.

The Globe Malleable Iron & Steel Company, Syracuse, N. Y., has plans completed for plant additions to cost about $150,000. Besides an addition 90 x 60 ft., to its present manufacturing building it will erect a stock rack building, 60 x 150 ft., one story; a sand-blast and pickling building, 60 x 90 ft., one story; a die-sinking building, 40 x 90 ft., one story; a dry storage building, 40 x 90 ft., one story; a shipping-room and superintendent's office, 35 x 90 ft., one story, all of reinforced concrete, and a powerhouse, 40 x 60 ft., one story, of reinforced concrete and steel.

The Electric Rod Mill, Rome, N. Y., has been incorporated by Clarence R. Keeney, Frank M. Hotter, Jr., and Herbert T. Dyett, all of Rome, and will manufacture wire rods, insulated wire, castings, etc.

The J. Wiss & Sons Company, 33 Littleton Avenue, Newark, N. J., manufacturer of shears, cutlery, etc., is preparing plans for a four-story and basement extension to its factory, 50 x 75 ft., which will give 18,750 sq. ft. of floor space, to be used to increase the output of its solid steel department. The demand for surgical and bandage scissors for war needs has largely made the addition necessary.

The Elmira Commercial Motor Car Company, Elmira, N. Y., has been incorporated with a capital stock of $500,000 and will manufacture auto-trucks, etc. Henry Bush, Albert Von Beaulieb and George Gebbie, of Elmira, are the directors.

The additions to be made to the plant of the Buffalo Bolt Company, North Tonawanda, N. Y., comprise a rolling mill 80 x 400 ft., and a heat-treating building 48 x 112 ft., both one story. The general contract has been let to Morris & Allen, Builder's Exchange, Buffalo. The approximate cost, with equipment, will be $250,000.

The board of contract and supplies, Schenectady, N. Y., is in the market for a 10-ton hand power crane.

The Buffalo Copper & Brass Rolling Mill Company has let contracts covering two shop buildings, 250 x 600 ft., and 250 x 400 ft., respectively, and a brick and steel laboratory building to be added to its plant at the New York Central Railroad, Denver and Ansteth Streets and the Military Road, Buffalo.

Baltimore

BALTIMORE, MD., Aug. 2, 1915.

The specifications for the first group of buildings to be erected by the Bartlett-Hayward Company, Scott and McHenry Streets, Baltimore, Md., which has received an order for $12,000,000 worth of shells call for a two-story fireproof machine shop at Scott and Ramsay streets, 71 x 422 ft., to cost about $50,000, and a one-story boiler and forge shop on the west side of Scott Street, 171 x 337 ft., to cost about $118,000. The contract has been awarded to J. Henry Miller, Inc., Eutaw and Franklin Streets, Baltimore. A. S. Miller, representing Humphries & Miller, engineers, New York City, has been engaged as consulting engineer in connection with the munition order. Work on the new buildings is being rushed and it is said that the order already received may be doubled.

The National Enameling & Stamping Company, 1901 Light Street, Baltimore, expects to receive a contract to furnish the British Government a large number of field kitchens. William H. Matthai is manager.

An addition which will cost about $500,000 will be built to the plant of the Baltimore Car & Foundry Company, Curtis Bay, Md., affiliated with the Standard Steel Car Company, Butler, Pa. The improvement will give the plant nearly nine acres of floor space. It is stated that the work

of the company will be extended to include steel construction and bridge work. The new building will be four stories, and included in the equipment will be seven 20-ton cranes and twelve 7½-ton cranes. A. N. Fay, Frick Building, Pittsburgh, Pa., is purchasing agent.

A site in Baltimore or vicinity for a plant to cost $350,000 is being sought by Messimer & Carreau, 101 Park Avenue, New York, for a New Jersey client. The character of the plant has not been announced, but 40,000 ft. of floor space and much machinery will be required.

Samuel T. Williams, engineer, 223 North Calvert Street, Baltimore, is seeking prices on hoisting engines and lathes.

The Maryland Water Company, Elkton, Md., to issue $40,000 bonds for extensions and additional machinery. John H. Tarrel is secretary.

The Enterprise Hardware Company, Frederick, Md., which is planning the establishment of a plant for the manufacture of locks and hinges, is seeking prices on boilers, drills, engines, lathes and shafting.

The City Point Ice Corporation, City Point, Va., has been incorporated with $50,000 capital stock by R. W. and S. M. Herfurth, Alexandria, Va.

The Gyro Metal Works, Norfolk, Va., has leased a one-story shop and foundry for general brass and iron foundry work, machining, automobile repairing and pattern making.

The Virginia Metal Corporation, Roanoke, Va., recently incorporated with $150,000 capital stock, will manufacture corrugated culverts and metal forms for concrete construction. It succeeds the Virginia Metal & Culvert Company. The officers are L. C. Stewart, president; M. A. Quinn, vice-president, and James E. Walker, secretary and treasurer.

The construction of a plant for the manufacture of submarine tubes to cost about $50,000 is said to be under consideration by the Williamson Submarine Company, Newport News, Va.

The York Furniture Company, West Point, Va., has been incorporated with $50,000 capital and will construct a factory. The officers are Crosby Thompson, president; J. A. Booth, vice-president and general manager, and L. D. Byron, secretary and treasurer.

The Lebanon Light & Power Company, Lebanon, Va., will install an electric plant to cost $4,500. O. S. Burns is manager.

A large number of brass furnaces are being turned out by the Monarch Engineering & Mfg. Company, Curtis Bay, Md. Most of them are being made for companies engaged in the manufacture of automobile parts.

G. Ober & Sons Company, United States Fidelity & Guaranty Building, Baltimore, plans extensive improvements to its fertilizer plant at the foot of Hull Street.

William V. Wolfe and Harry Grove, 334 North Market street, Frederick, Md., plan the construction of a fully equipped garage.

New England

BOSTON, MASS., Aug. 2, 1915.

The Westinghouse Electric & Mfg. Company made the announcement last week that it had received a further order for 800,000 rifles with an option on an order for 200,000 more. Details of the contract cannot be had, but Louis A. Osborne, vice-president of the New England Westinghouse Company, Springfield, Mass., is quoted as saying that the order will probably be filled there. The work will go forward along with the company's initial order for 1,000,000 rifles for Russia and it is presumed that the new order for equipment is from the same source. It is estimated that over 3500 rifles a day will be turned out. Under the terms of the first order a price of more than $25 per rifle was made. The same figure will undoubtedly approximate the cost of a rifle under the new contract.

Reports have been made that the General Electric Company has received orders for war supplies at its plant at Pittsfield, Mass. C. C. Chesney, general manager of the factory, is quoted as admitting that such an order has been received. The plant has been engaged for some time manufacturing tools and dies for producing war supplies. Further details regarding the contract are not yet available.

The Corbin Screw Corporation, New Britain, Conn., is reported at work on a sub-contract for shrapnel parts for Russia worth about $90,000. Other factories in this city are connected with war business. The North & Judd Mfg. Company are participating in a shrapnel parts order to the extent of about $500,000. The Traut & Hine Mfg. Company has received at least three successive orders calling for 120,000 gross of brass fasteners for leggings for the British Government.

An interesting phase of business in New England is the closing down of plants, usually for a week, in order to give the men a vacation and overhaul the equipment. This is being done this summer among many companies in spite of the tremendous pressure of business.

Echoes of the Bridgeport labor troubles can be heard in nearly every important center. The Becker Milling Machine Company, Hyde Park, Boston, the Peck, Stow & Wilcox Company, Southington, Conn., the Boston & Maine Railroad, and others, are having labor difficulties. In some cases they involve only minor disputes with disgruntled men, and in other cases they are in connection with the effort to secure the 8-hr. day.

The Remington Arms-Union Metallic Cartridge Company, Bridgeport, Conn., has awarded Stewart & Co., who are building their new plant, a contract for the construction of a power plant and powder magazines.

The Winchester Repeating Arms Company, New Haven, Conn., has begun the construction of a large freight terminal dock on the harbor. The C. W. Blakeslee Company is the contractor. It is interesting that the company has made a contract for the removal of thirteen houses from ground needed for its new buildings. A hospital is also among improvements it has under way.

The Bridgeport Brass Company, Bridgeport, Conn., has plans for a one-story brick addition to its present casting building on Grand Street to cost about $70,000. It will increase the daily capacity of the plant about 100,000 lb., and will give employment to about 100 more men. W. R. Webster is superintendent.

The Scovill Mfg. Company, Waterbury, Conn., has awarded contract to the Sperry Construction Company, New Haven, for the construction of the addition to its plant, 309 x 600 ft., with two ells, 218 x 309 ft., and 166 x 200 ft., both one story.

Contract has been awarded to W. J. Sexton, 84 Boulevard, Southington, for the erection of a factory building for the Rowe Calk Company, Plantsville, Conn. It will be of brick and concrete, 33 x 54 ft., two stories. Ford, Buck & Sheldon, Inc., is the engineer.

The Buckley Welding Company, Waterbury, Conn., has been incorporated with a capital stock of $2,025. Edward M. O'Brien is president and William A. Buckley is treasurer.

The Carlyle-Johnson Machine Company, manufacturer of friction clutches, reverse gears, etc., Manchester, Conn., is reported to be installing additional machinery.

Richards & Co., Stamford, Conn., plan to build two more factory buildings, adjoining their plant on Ludlow Street, at an estimated cost of $30,000. They will be 65 x 223 ft., and 65 x 133 ft., both one story, of brick construction.

The New Departure Mfg. Company, Bristol, Conn., manufacturer of ball bearings, which has made heavy purchases of machinery recently, will build a steel building 60 x 100 ft. It is said that the company plans further additions to its plant.

Work has started on an addition to the plant of the M. B. Schenk Company, Meriden, Conn., manufacturer of hardware, 45 x 50 ft., one story, of concrete construction.

The Southington Hardware Company, Southington, Conn., at its annual meeting July 27, elected the following officers: President, J. H. Pratt; treasurer, Fannie Gridley; secretary, J. Wilder Howe; and as directors, M. H. Holcomb, M. B. Willcox, J. H. Pratt, C. H. Clark, C. C. Chamberlain and B. H. Barnes. The factory is working until 9 p. m. every day.

The United States Government is building a two-story addition to the torpedo factory at Newport, R. I., 400 ft. in length.

The Hartford Machine Screw Company, Hartford, Conn., a subsidiary of the Standard Screw Company, has leased the former Hartford Dairy Company plant for five years to provide more space for manufacturing. It is planned to have it ready for operations about Aug. 15.

The Union Electric Light & Power Company, Unionville, Conn., has increased its capital stock from $225,000 to $250,000.

The Blake & Johnson Company, Waterbury, Conn., is clearing property adjoining its plant so that operations can be started without any delay in case it decides to make further additions.

The Yoerg Tire & Rubber Company, Holyoke, Mass., has had plans prepared for a service building, 62 x 122 ft., to cost $18,000.

The Ware Grip Coupling & Nipple Company, Ware, Mass., has plans for a two-story addition to its plant on Morse Street, which will double its present capacity.

The Fore River Ship Building Corporation, Quincy, Mass., has taken out a permit for a brick and steel ship tool and storage shop, 185 x 779 ft., to be erected on the East Howard

...reet side of the company's plant at an estimated cost of ...,000.

E. E. Fairbrother has taken a lease of a frame lumber ...ishing plant, one story, 46 x 140 ft., to be erected at ...owhegan, Me., by the Central Maine Power Company.

The Pocahontas Fuel Company, 1 Broadway, New York ...y, has purchased Long Wharf, one of the largest piers at ...ortland, Me., and plans to build a coal-handling plant with ... discharging capacity of 5000 tons a day, to be completed ... next March.

The Rowbotham Machine Company, builder of special ...d automatic machinery, Waterbury, Conn., is adding to its ...anufacturing space over 100 per cent, but does not con...mplate adding new equipment for it, as the additions are ...incipally for erecting purposes.

The Baird Machine Company, Bridgeport, Conn., manu...acturer of automatic wire and sheet-metal working ma...hinery, has just completed a storehouse, 50 x 150 ft.

The Whitney Mfg. Company, Hartford, Conn., has pur...hased a number of new machine tools and has rearranged ...s equipment. It has increased its output on hand milling ...achines from one to four a day.

The Builders Iron Foundry, 9 Coddings Street, Provi...ence, R. I., made preparations last year in anticipation of ...creased business, including the leasing of lofts for as...embling purposes and the purchase of machine-tool equip...ent to increase its capacity to about 20 per cent.

The Standard Machinery Company, Auburn, R. I., has ...rchased within the last two months one 5-ft.-arm heavy ...adial drill, one 3½ x 36-in. horizontal turret lathe, one ...ternal grinding machine and one cutting-off machine for ...mall round stock. Buildings erected in 1913 are sufficient ...r present needs.

The Metal Products Corporation, Providence, R. I., has ...arded contract for brick additions to its plant, 60 x 212 ft., ...e-story, and 45 x 60 ft., two-stories and basement.

The Automatic Machine Company, Bridgeport, Conn., is ...creasing its tool equipment about 25 per cent by the pur...hase of standard lathes, planing, milling and boring ma...hines. Its work is now largely concentrated on the manu...acture of automatic threading lathes, extensively used in ...e manufacture of high explosive shells.

The National Machine Company, manufacturer of presses, ...rface grinding machines, etc., 111 Sheldon Street, Hart...rd, Conn., has increased its manufacturing facilities by ...e addition of a few tools and by overhauling its heavy ...uipment. It is considering the addition of more manu...acturing space. It has increased its working force by fifty ...en since spring.

The Union Twist Drill Company, Athol, Mass., has added ...aterially to its plant by the purchase of machinery and ...s also making machines of its own, with a view to com...leting the equipment of its recently finished factory building.

The Blanchard Machine Company, mechanical engineer ...d machinist, Cambridge, Mass., has started the construc...ion of an addition to its factory which will increase its ...anufacturng space about 15 per cent.

The Whitcomb Blaisdell Machine Tool Company, Wor...ester, Mass., has purchased a quantity of machinery, erected ...shipping room and has extended its foundry about 100 ft.

The Jones & Lamson Machine Company, Springfield, Vt., ...anufacturer of flat turret and automatic lathes, adopted a ...ll-time schedule about the middle of last December and ...as since been increasing its working force until it now em...loys about 500 men, about 50 being on the night shift. ...At least half of the day force also works three evenings a ...eek.

Philadelphia

PHILADELPHIA, PA., Aug. 2, 1915.

The material aspects of war business are as astonishing to machine-tool dealers as they are to the layman. Representatives who have visited Eddystone speak with a degree of wonder at the magnitude of the construction work and the possibilities and probabilities of operations conducted on such a vast scale. The Baldwin Locomotive Works is continually in the market. It is understood that some of the machinery it wants cannot be delivered in less than two years. Initial delivery in some cases will take six months. Among its recent purchases were about forty turret lathes. It is believed that contracts for about $2,000,000 worth of equipment will be closed in the near future.

The Hero Mfg. Company, manufacturer of oilers and metal novelties, Philadelphia, is reported to have been given a time fuse contract worth about $500,000. It is in the market for equipment, presumably for this work. The Frankford Arsenal will receive bids until Aug. 7 for two screw machines for chucking 3-in. shrapnel. The American Bronze Company, Berwyn, Pa., will purchase one hand screw machine. It is understood that a prominent car-building company is considering the manufacture of auto trucks and jitney buses, and is inquiring among the trade for quotations on the manufacture of parts.

Fayette R. Plumb, Inc., axe and hatchet manufacturer, Philadelphia, Pa., has placed an order with its St. Louis, Mo., branch for the manufacture of bayonets. It is understood that the order came from J. P. Morgan & Co., and calls for 50,000 bayonets at a cost slightly less than $100,000. C. H. Bascom is manager of the St. Louis factory, which is working two shifts. It is stated that neither a confirmation nor a denial could be had regarding the matter from Fayette R. Plumb.

The plant of the Drummond Iron Works, Reading, Pa., has been sold to Edwin A. Moore & Co., Philadelphia.

The Nitrates Products Company, Mount Carbon, Pa., has placed rush orders for the enlargement of its plant in order to handle a large number of orders.

The former Thurlow Steel & Forge Company plant at Chester, Pa., has been sold to the newly organized Thurlow Steel Works, Inc., and placed in operation. The capacity of the plant will be enlarged.

The Landis Tool Company, Waynesboro, Pa., has completed a three-story shop, 100 ft. square, and contemplates the erection of another building, 120 ft. square for the manufacture of boring machines.

H. B. Underwood & Co., manufacturer of special railroad repair shop tools, 1015 Hamilton Street, Philadelphia, Pa., have increased their facilities within the past year by the addition of a building containing about 8000 sq. ft., which it has equipped to increase its capacity.

The International Glass Company, Millville, N. J., has plans for a one-story brick factory, 80 x 200 ft. H. H. Hankins, Bridgeton, N. J., has been awarded the contract.

The John A. Roeblings' Sons Company, Trenton, N. J., is building factory buildings, 61 x 456 ft., 131 x 386 ft., 61 x 358 ft., and 58 x 89 ft., all two stories, of brick and steel construction, estimated to cost about $150,000.

C. A. Blatchey, Drexel Building, Philadelphia, Pa., is revising plans for a waterworks for Gloucester City, N. J., including boilers, pumps, etc. Bids will be received shortly.

Plans have been drawn for a foundry and a machine shop for the Eynon-Evans Mfg. Company, brass manufacturer, Fifteenth and Clearfield Streets, Philadelphia, Pa., 50 x 120 ft., and 58 x 128 ft., both three stories, of brick and concrete.

James & George D. Bromley, carpet makers, Adams and Jasper Streets, Philadelphia, Pa., have awarded contract to George H. Thirsk, 2739 Jasper Street, for the erection of a boilerhouse to cost about $1,000.

William Linker, Heed Building, Philadelphia, Pa., silversmith, has taken out a permit for an eight-story brick and concrete factory, 36 x 144 ft., to be erected at 831 Cherry Street.

Bids will be received Aug. 9 for a two-story addition of brick and stone, 50 x 200 ft., to the Pennsylvania State Arsenal, Harrisburg, Pa. C. A. Keyworth is the architect.

The P. Skelly Bolt Company, Twenty-fourth and Callowhill Streets, Philadelphia, Pa., has increased its capital stock from $15,000 to $60,000.

Chicago

CHICAGO, ILL., Aug. 2, 1915.

The machine and forge shop operator who does not find some improvement in the volume of his business is becoming more conspicuously the exception. The amount of contract and jobbing work that is being let and sub-let is indeed a feature of the situation. The effect upon the machinery trade is to sustain the brisk demand which has led to active selling for many weeks past. Inquiry for second-hand equipment is particularly insistent and recent transactions in the acquisition of used machinery are of unusual magnitude. Among such is the purchase of the Richmond, Ind., plant of the M. Rumely Company by Harris Brothers, Chicago. The plant is to be dismantled. The automobile industry continues very active both in shop operation and plant extensions. The Willys-Overland Company is placing contracts for the machining of gears and other parts for a new model car and the Continental Motor Mfg. Company, Detroit, is making an extension at its works to cost $500,000, while the Studebaker Corporation it is understood will build an automobile manufacturing plant at South Bend, instead of extending its operations further at Detroit.

The Brokaw-Eden Mfg. Company, manufacturer of washing machines, Chicago, Ill., will move its entire plant from

Chicago, to Alton, Ill., and will also bring its office there from St. Louis, Mo. H. W. Eeler is treasurer and manager.

The Moline Tool Company, manufacturer of drilling and boring machines, Moline, Ill., has not increased its shops nor added much equipment; but it has rearranged its machinery, increasing its capacity at least 50 per cent.

The International Machine Tool Company, manufacturer of turret lathes, Indianapolis, Ind., is adding about 15,000 sq. ft. of floor space. It has purchased a number of new tools and plans to increase its output very materially between now and the first of the year.

The Prest-O-Lite Company, Indianapolis, Ind., has awarded contract for the construction of a factory in East Omaha, Neb., to cost about $10,000.

The Tangley Mfg. Company, Muscatine, Iowa, manufacturer of air calliopes, etc., will start the erection of a concrete factory, 50 x 100 ft., to cost about $3,000.

The American Shoe Heel Company, Centralia, Ill., is erecting an addition to its plant and will install additional power equipment as well as 24 machines to increase its output.

Cleveland

CLEVELAND, OHIO, Aug. 2, 1915.

Foreign inquiries for turret machine lathes, which fell off recently, have increased materially the past week or two. Several inquiries for large lots of machines for export to Russia have come out, but most makers are unable to give these much consideration, as they cannot make deliveries before next year on machines that are wanted as soon as possible. A number of inquiries for turret lathes have come from Italy and others are pending from England. The domestic demand for all types of machine tools used in making shells continues heavy. The demand for presses for use in making shells is very active, both here and abroad. Locally the demand for machine tools continues very good, dealers getting a number of small orders from various sources. The Upson Nut Company, Cleveland, placed orders last week for ten tools for tool room equipment in its bolt and nut works, including lathes, milling, planing, shaping and grinding machines and drill presses.

The Ellwell-Parker Electric Company, Cleveland, maker of storage battery trucks for industrial plants, will enlarge its plant by the erection of a four-story brick and steel building, 66 x 120-ft., to be used for the most part as an erecting department. An electrically-operated freight elevator will be installed. Plans have been prepared by George S. Rider & Co., engineers, Century Building. The contract for the steel work has been placed with the Forest City Steel & Iron Company.

A new automobile company, the name of which is at present withheld, will establish a plant in Cleveland, and has acquired a site on East Seventy-ninth Street. The contract for the first building providing about 25,000 sq. ft. of floor space, will be let in a few days. The plans are being prepared by the National Engineering Company, Marshall Building.

The Poese Machinery & Mfg. Company, Cleveland, is the name of a new company that has established a plant at 701 Commercial Building for making automatic tapping machines.

The Vlchek Tool Company, Cleveland, will enlarge its plant by the erection of a three-story factory, 40 x 100 ft.

The Cleveland White Metal Company, Cleveland, recently organized, will erect a two-story plant, 50 x 150 ft., on Grant Avenue.

The Johnson & Jennings Company, Cleveland, will enlarge its plant by the erection of an addition to its foundry to cost $5,000.

The Cleveland Railway Company, Cleveland, will shortly begin the erection of new shop buildings on Denison Avenue, including a repair shop, boiler and pump house, and a foundry.

The American Steel Tube Company, Toledo, Ohio, recently incorporated, is establishing a plant in the building on Erie Street, Toledo, formerly occupied by Baker Brothers. It occupies a ground space 40 x 170 ft., one half being three stories high, and the remainder one story. The company will make light gage welded steel tubing, in thickness up to 16 gage for use in automobiles. J. H. Cauffield is president; Arthur Heubner, vice-president, and S. A. Snell, manager.

The Brightman Nut & Mfg. Company, Sandusky, Ohio, will move into new quarters shortly, having made arrangements to occupy a building that will be fitted up into a modern factory and which will give it a large increase over its present capacity.

The National Electric Welder Company, Warren, Ohio, has increased its capital stock from $10,000 to $75,000. It recently moved into a new plant providing much larger quarters.

The Gramm-Bernstein Company, Lima, Ohio, has just received an export order for 500 4-ton motor trucks. It has awarded to the Champion Iron Works, Bellefontaine, Ohio, a contract for an addition to its plant, 50 x 200 ft.

Detroit

DETROIT, MICH., Aug. 2, 1915.

The market for finished iron and steel products has been much more active the past few days, the increased demand for home consumption being especially noticeable. Tool makers and dealers are enjoying a brisk demand from Canada, as manufacturers there are denied the European markets. Skilled labor is greatly in demand, and the second half of the year is entered with highly encouraging prospects.

The Sturdevant-Murray Mfg. Company, Detroit, Mich., manufacturer of wind shields, etc., has increased its capital stock from $25,000 to $150,000.

The Wilson Foundry & Machine Company, Pontiac, Mich., announces an expansion of its plant requiring a new foundry equal to its present one and a machine shop more than twice as large as the present one. The building operations will be completed by Dec. 1.

The Gogebic & Iron County Railway & Light Company, operating a trolley line and electric light plants in the Upper Peninsula, has been reorganized. It is now known as the Iron & Bessemer Railway & Light Company, with a capitalization of $3,000,000.

The Bennett Mfg. Company, Plymouth, Mich., has been awarded the contract for manufacturing the Michigan automobile and motorcycle license plates to be issued for 1916.

R. G. Woods and J. F. Benoit, owners of the Pearl Blanking plant, Benton Harbor, Mich., are planning to add five new machines to their present equipment for the manufacture of buttons.

A new roundhouse, to cost about $3,000, will be erected by the Grand Trunk Railway system in Bay City, Mich. Work will commence at once.

The Wayne Steering Wheel & Bow Company, Wayne, Mich., has been organized to manufacture motor steering-wheels and bows, with an authorized capital stock of $10,000.

The Henry Rowe Mfg. Company, Newaygo, Mich., has purchased the plant of the Hunt-Buse Mfg. Company, including the water power. W. E. Tallmadge, Grand Rapids, who was interested in the Hunt-Buse Mfg. Company, becomes a director of the Henry Rowe Mfg. Company.

The Organic Chemical Company, Wyandotte, Mich., organized to manufacture aniline dyes, has installed machinery and will start operation at once. It has been storing up supplies for four months, and is receiving many offers for its entire output, because of the lack of dye supplies following the shutting off of the German market. John Livingstone is in charge.

Cincinnati

CINCINNATI, OHIO, Aug. 2, 1915.

The demand for lathes continues unabated, and all stocks of both new and second-hand machines were wiped out some time ago. Rebuilt lathes have lately sold at higher prices than at any time in the history of the trade. Radial drilling machines are also in good demand, and the inquiry for shapers shows improvement, but this branch of the business is behind the record made by other machine tools. All local machine tool plants are operating up to full capacity, with night shifts employed in many shops. With the exception of a contemplated building addition to the plant of the Cisco Machine Tool Company and a power plant addition for the R. K. LeBlond Machine Tool Company, no new building extensions are contemplated locally, but all plants are installing extra machines in order to increase their output. All local machine-tool builders have made gradual advances in wages, and, as far as is known, no labor troubles are in sight.

The call for metal-working machinery is not quite as brisk as it was thirty days ago. The boiler and tank business is unchanged but a continued improvement is noted in portable electric drilling machines. Small motors and generators are also good sellers. The jobbing foundries are very busy, with a very few exceptions to be noted. The stove foundries are passing through a very dull period.

The City Ice Delivery Company, Cincinnati, will build a 75-ton ice plant in Price Hill, a suburb.

A. Jones & Co., 208 Elm Street, Cincinnati, are having made for a shop to build machines for the manufacture of automatic soap presses. It will be 74 x 100 ft., one of brick and steel. Machine tools and power equipment will be required.

The Instantaneous Glue Converter Company, Cincinnati, let contract for a factory to be constructed on Montgomery Road.

The Warner Equipment Company, Cincinnati, suffered a loss last week estimated at $50,000. The company repairs locomotives and other rolling stock. Nothing is yet known as to plans for rebuilding.

George J. Helfrich, Blymyer Building, Cincinnati, is interested in a company to be formed for the manufacture of patented steel horseshoe calk.

It is reported, but not confirmed, that the American Can Company, Hamilton, Ohio, has lately received a large war order, and intends adding to its manufacturing facilities.

The Stanley Mfg. Company, maker of small metal signs, Dayton, Ohio, is having plans prepared for an addition to its plant.

The seven-story addition to the plant of the Dayton Engineering Laboratories Company, Dayton, Ohio, is now nearing completion, and equipment will be installed at an early date.

The Board of Education, Springfield, Ohio, of which W. H. Hines is clerk, will open bids Aug. 23 for the following machine tools:

Two 18-in. x 8-ft. motor-driven lathes
Four 14-in. x 6-ft. motor-driven lathes
One 13-in. x 5-ft. motor-driven lathe
Two 12-in. x 6-ft. motor-driven lathes
One 26-in. back geared motor-driven shaping machine
One pedestal type motor-driven dry emery grinding machine
One single-spindle quick speed change sensitive drill press.

Lindley M. Clark and Harry Minshall, Springfield, Ohio, are interested in a company being formed to manufacture a hand harvesting machine.

The John O. Heinze Company, Springfield, Ohio, is equipping two floors in the Shuey Building for the manufacture of self starters for automobiles.

The Bowlus-Hackett Company, Columbus, Ohio, has commenced work on a cold-storage plant on West Washington street.

The Mead Pulp & Paper Company, Chillicothe, Ohio, has extensive plans under way for enlarging its plant.

The Standard Electric Tool Company, Cincinnati, reports the receipt of a large order for portable electric drilling machines from a customer in England. The company's export business has been very satisfactory the past few weeks.

The John Steptoe Company, manufacturer of shaping and planing machines, Cincinnati, Ohio, has increased its capacity about 25 per cent by the addition of new machinery; does not plan to make additions to its buildings.

The Central South

LOUISVILLE, KY., Aug. 2, 1915.

Business conditions are regarded by machinery men as having improved considerably the past thirty days. While they report business at present rather quiet, the unanimous sentiment is that fall prospects are excellent, and that a large volume of business will certainly be booked for delivery during the remaining four or five months of the year. Boilermakers are especially optimistic, having received good orders for steam equipment and also for sheet-metal work, tanks, etc. Foundries report a good demand for jobbing work, and drop-forging manufacturers are also busy. The demand for electric motors is hardly as brisk as it has been, but prospects continue good in this direction.

The Nashville Spring & Mattress Company, Nashville, Tenn., has leased a building at Paducah, Ky., and will equip it as a branch factory.

The Highland Film Corporation, Fort Thomas, Ky., which was recently organized, has announced plans for the construction of its plant. It will build a powerhouse to cost $5,000, and a garage and repair shop to cost $30,000.

The Hickman Gin Company, Hickman, Ky., will install a 75-hp. motor and a hydraulic press in connection with a new three-stand gin outfit to have daily capacity of 50 bales of cotton.

Blane & Smith, Cadiz, Ky., are purchasing equipment for an automobile garage and repair shop.

The Middlesboro Electric & Auto Works, Middleboro, Ky., which operates a coal mining machinery repair shop, will increase its capacity.

The Ross & Republic Marble Company, Knoxville, Tenn., whose plant was burned last week with a loss of $75,000, has announced that it will rebuild at once. A. M. Glasgow is vice-president and general manager.

The Clinton Electric Light & Power Company, Clinton, Tenn., will change its system from direct to alternating current, and will install boilers, an engine, a generator, and 30 hp. in motors. H. G. Amerine is in charge.

North Chattanooga, Tenn., is considering the establishment of an electric lighting system. Address Mayor Voigt.

The Thompson Electric Clock Company, Memphis, Tenn., is planning the manufacture of timepieces for automobiles and other vehicles. Its principal requirement will be electric batteries. W. H. Thompson is in charge.

L. B. West Construction Company, Chattanooga, Tenn., is planning the manufacture of a new type of asphalt plant.

The Chattanooga Handle Mfg. Company, Chattanooga, Tenn., has leased a building and will equip it for the production of tool handles.

The John G. Duncan Company, 308 W. Jackson Avenue, Knoxville, Tenn., is in the market for a second-hand ice machine.

The Kingsport Extract Corporation, Kingsport, Tenn., has let a contract to the Wicks Boiler Company, Saginaw, Mich., for the installation of 1000 hp. in boilers. The engine room will be 40 x 50 ft. A machine shop, 28 x 70 ft., will also be equipped. R. Y. Grant is president and in charge of machinery purchases.

W. M. Williamson and others, Dayton, Tenn., have purchased a 20,000-acre tract of hardwood timber and will erect a sawmill.

Madisonville, Tenn., is considering the establishment of an electric light plant. W. H. McCroskey is mayor.

The Jackson-Eagleton Brick Company, Marysville, Tenn., has been organized and will equip a plant with a capacity of 50,000 bricks a day.

The Deeth Mfg. Company, Memphis, Tenn., has been incorporated with $15,000 capitalization, and will manufacture machinery for the production of soft drinks. John Deeth, D. G. Harkey and others are incorporators.

William Culberts' Sons, Nashville, Tenn., have let contracts for the erection of a boiler shop.

B. F. Siler and J. E. Jones, Jellico, Tenn., are purchasing equipment for an automobile garage and repair shop.

Milwaukee

MILWAUKEE, WIS., Aug. 2, 1915.

An extraordinary demand for skilled labor has set in and for the first time in many months the daily newspapers are filled with advertisements for machine shop help. Not alone are Milwaukee employers seeking workmen, but Detroit and other cities are coming to Milwaukee to fill requirements, and southern Wisconsin manufacturers are making hurry calls on the Milwaukee free employment bureau. All available men are being put to work, and in many cases the supply is far too small.

Machine tool makers report a continuance of the almost unprecedented demand, which comes both from domestic users and foreign countries. The return of better conditions is bolstering up new construction projects that have been indefinitely postponed for the last two years, and structural steel shops feel that they are to share in the new prosperity soon. Prime movers are in unprecedented demand; but it must be considered that for some time there was no demand at all. The money situation is easier and collections show improvement.

Oscar Ekelund, Petrograd, Russia, spent several days in Milwaukee last week, calling on machine shops and factories. He is in America as representative of Russian manufacturers who require machinery formerly obtained from German manufacturers, and his mission does not have connection with orders for war munitions for Russia.

The Kempsmith Mfg. Company, manufacturer of milling machines, Milwaukee, Wis., has increased its facilities about 100 per cent in the last three months by the addition of manufacturing space and equipment together with the operation of a night shift.

W. D. Johnson and R. J. Hoover, Lancaster, Wis., have formed a partnership and will erect a new garage and repair shop.

The Wisconsin Welding & Cutting Company, 315 Fourth Street, Milwaukee, is installing new equipment, including a large furnace. An aluminum welding department, in charge of Gustave Johnson, has been established. The company does all kinds of boiler and automobile work. C. H. Hansen is manager.

The Fitzsimmons Steel Products Company, Milwaukee, capitalized at $40,000, has been incorporated by Edward L. Wolff, Ernest Prinz and George H. Gabel, an attorney. The promoters are not quite ready to divulge their plans.

The Aerial Cutlery Company, Marinette, Wis., which was reorganized and refinanced several months ago, is now running with the largest force since its establishment, and may find it necessary to go on a night schedule. All of the business is domestic.

The Marble Arms & Mfg. Company, Gladstone, Mich., is reported to have been awarded a contract by the Russian Government for 400,000 rifle sights for small arms now being manufactured in the United States. Weekly shipments of 15,000 to 25,000 sights are now going forward.

The Jersild Fire Escape Corporation, Neenah, Wis., is preparing to contract for the manufacture of its product by local machine shops and will not build a plant of its own for the present. J. F. Jersild is president.

The Badger Welding & Cutting Company, Green Bay, Wis., has been organized by Walter F. Gerald, formerly associated with the Universal Oxygen Company, Sheboygan, Wis.

C. J. Conohan, 378 Brady Street, Milwaukee, will erect a public garage and repair shop of brick and concrete, 77 x 80 ft., one story.

The Cluley Multiplier Company, Chicago, Ill., has decided upon Green Bay, Wis., as the permanent location of its works. It has been re-financed by Milwaukee, Chicago and Green Bay capital, and has leased the plant of the American Wood Working Machine Company, Green Bay, for five years, and is in the market for a list of machine tools, special machinery, forging, pressing and stamping equipment. John P. Cluley is general superintendent.

The Enterprise Iron Works, Milwaukee, have been organized by Robert Wettstein, formerly of the C. Colnik Company, and Carl Broenen, formerly of the A. H. Wagner Architectural Iron Company, Milwaukee, and has established shop and offices at 240-250 Madison Street. It will manufacture and design structural steel, ornamental iron, brass and bronze work.

The Simple Gas Engine Company of Minnesota is now operating its new and permanent works at Ashland, Wis. It occupies the former plant of the Ski Mfg. Company, and its castings are made under contract with the Roen Foundry Company, Ashland, C. A. Anderson is general manager.

The Keller Pneumatic Tool Company, Fond du Lac, Wis., has refused an order for approximately 500,000 shell parts from an American shrapnel maker representing European nations, so that it may carry out its intention of attaining a large production of a small electric refrigerating device which eliminates the need of ice. The other products of the Keller factory, including pneumatic appliances, volumetric air meters, mailing machines and counting machines, will be continued.

The Gisholt Machine Company, Madison, Wis., machine tools, lathes, etc., is spending about $30,000 in enlarging its productive facilities to accommodate increased orders for domestic and foreign delivery.

The Gas Power Engineering Company, North Avenue and Second Street, Milwaukee, has awarded the contract for erecting a third story addition to the Wisconsin Bridge & Iron Company, Milwaukee.

The Milwaukee Machine Tool Company, Sixtieth Avenue and Mitchell Street, West Allis, is erecting an addition 75 x 114 ft. The company is owned and operated by Kearney & Trecker, makers of milling machines, West Allis, and both shops are working night and day on orders which practically have swamped them. Additions now under way will make possible a large increase in production.

Birmingham

BIRMINGHAM, ALA., Aug. 2, 1915.

Even the most conservative machinery dealers admit a substantial betterment in business in the past month, together with an encouraging outlook for further improvement. The demand for gasoline engines is especially good and all agricultural machinery is on the active list. Machine tools would be liberal sellers if they could be found. The steam engine demand is not as good as that of the gasoline engine. Nothing worth while is taking place in the sawmill trade.

The Sloss-Sheffield Steel & Iron Company, Birmingham, has appropriated $50,000 for the purchase of electrical machinery to be installed in its ore mines at Russellville, Ala. It will supply its own motive power.

Edward M. Hyde and associates are in consultation with Alabama interests in regard to the building of a shipbuilding plant at Mobile, to cost $4,000,000, of which mention has heretofore been made. A tax exemption bill has passed the lower house of the Alabama Legislature.

W. G. Burnett, Atlanta, Ga., and other owners of Central Ice Company, Birmingham, Ala., announce that plant will be doubled in capacity and an additional p erected at a cost of about $50,000.

It is understood that the Alabama Power Company build a hydroelectric plant at Little River Falls on the C River, where it owns a site.

The Atlantic Compress Company, Dothan, Ala., will build its compress recently burned at a loss of $80,000. A. Ward is local manager.

The Jackson Electric Company, Jackson, Ala., will b an electric lighting plant. R. V. West is president.

The Savannah Dock & Warehouse Company, Savan Ga., has been organized with a capital stock of $100,00 Frank N. Smalley and others, to build river terminals.

The Wofford Shoals Light & Power Company, Corn Ga., will double capacity of its plant.

The Tucker Brick Company, Kissimee, Fla., has b organized by J. Wade Tucker and others for the manu ture of cypress wood paving blocks. Its plant is to h a daily capacity of 40,000 bricks.

St. Louis

ST. LOUIS, MO., Aug. 2, 1915.

The machine tool-market here continues to show impro ment. Each week the aggregate of business shows a sl increase, mostly on single tools. The demand comes fr all sources, indicating that the gradual betterment is g eral and likely to be permanent. In other fields rep coming in are of very encouraging character, particula with relation to crop and financial conditions, while c lections continue better than usual, even in previous pr perous periods. In nearly all lines of trade discounts being taken more freely than usual.

The American Fixture & Showcase Company, St. L Mo., has increased its capital stock from $12,000 to $70 to extend its manufacturing operations.

The Sams-Hout Water Power Development Comp Warrensburg, Mo., has been incorporated with a capital st of $14,000 by B. T. Sams, W. H. Hout and D. D. Corum equip water power plants.

The Iron & Steel Preserving Company, Kansas City, has been incorporated with a capital stock of $50,000 J. W. Berry, F. C. Gay and A. R. Gibson and will manu ture preservatives for metals, particularly structural i work.

The Lewis Metal Company, St. Louis, Mo., has been corporated with a capital stock of $15,000 by A. E. Le Isador Glueck and Louis Mayer to manufacture m products, recover metals, etc.

The H. S. H. Mfg. Company, St. Louis, Mo., has b incorporated with a capital stock of $10,000 by Gar Strode, Harry A. Hood and Philip G. Hoffman to manu ture radiator caps and other special devices.

The Aniline Products Corporation, St. Louis, Mo., been incorporated with a capital stock of $12,000 by Cla E. Udell, John J. Morse, J. D. Johnson and Oliver Frazie manufacture chemicals.

The Johnson County Light & Power Company, Kn noster, Mo., has been incorporated with a capital stock $15,000 by S. A. Kelley, Guy C. Cooley and James Ennis will equip an electric plant.

The Boonville Light, Heat & Power Company, Boonv Mo., of which W. A. Sombart is president, capitalized $75,000, has effected the consolidation of the Sombart C Company and the Boonville Electric Light & Power Comp and will make improvements in the equipment of both pla

J. R. Matthews, Kirkwood, Mo., has plans for an ice pl to cost about $18,000.

The Simonds-Shields Grain Company, Kansas City, M has increased its capital stock from $100,000 to $250 and will increase its elevator capacity at once.

The Sands-Smith Motor Company, Macon, Mo., will stall metal-working equipment. W. H. Smith is presid

The Midland Six Coal Company, Poteau, Okla., will open an old mine at Midland, Ark., and install equipm for raising 500 tons per day. M. A. Finney is president.

A brick plant to cost about $100,000 will be establis at Henryetta, Okla., by Frank Nicholson, Iola, Kan.

Boswell, Okla., is in the market for one 50-kw. 2200-v belt-driven generator, etc. James T. George is the engin in charge.

The Prince Electrical Equipment Company, Enid, Ok

been incorporated with a capital stock of $13,000 by Wilcox, J. Stuart Trimble and C. C. McVay.

The Oklahoma City Bridge & Construction Company, homa City, Okla., has been incorporated with a capital of $10,000 by H. F. Crawford, William O'Donnell and Hansen and is in the market for fabrication and con- tion equipment.

The American Glass Casket Company, Oklahoma City, has been incorporated with a capital stock of $225,000 W. L. Beck, Oklahoma City, T. C. Hamilton and Robert tine, Blackwell, Okla., and will build a plant to cost 000 with a daily capacity of 1000 waterproof glass ts.

Addie, Okla., is receiving bids for filter plant and pump- station equipment, including two 50-hp. oil engines, two x pumps, and other accessories. J. E. Davis is engineer harge.

Lehigh, Okla., will construct and equip water works to $28,000. Plans have been prepared by the Benham neering Company, Oklahoma City, Okla.

Sumner, Miss., Rowe Hays, mayor, will receive bids until 6 for one 25-hp. kerosene engine, one 300-gal. per min. trifugal pump, and other waterworks equipment.

Keshoba, Miss., will expend $30,000 on a water works and sewage disposal plant.

The Baton Rouge Electric Company, Baton Rouge, La., equip an electric station requiring three 500-kw. Curtis nes, three 100-hp. water-tube boilers, superheaters and equipment.

The T. E. Morrison Hardwood Tie & Timber Company, yeport, La., has been incorporated with a capital stock 0,000 by T. E. Morrison, W. M. Prater and John R.

Lafayette, La., will construct and equip a sewage dis- l system at a cost of about $100,000.

J. G. Michie and L. W. Calvert, Lake Charles, La., will a 15-ton ice-making plant.

The Pacific Northwest

SEATTLE, WASH., July 27, 1915.

The demand for electrical equipment to be installed in ll municipal plants throughout the Northwest has been . The number of small cities and towns installing mu- al light and water plants is increasing. Irrigation ma- ery has shown brisk demand, and the drainage districts ted in Idaho, Montana and Oregon are expected to her stimulate this branch.

The elevators and grain mills have been very busy pre- ng for the harvest, and a quantity of machinery has sold to meet these requirements. The lumber situation tinues practically as before reported, with no large or- placed within the week, although several are still ing.

The sawmill and lumber yard owned by Frank Betchart, , Wash., has been completely destroyed by a recent fire a loss of more than $60,000.

The Hercules Mine, near Burke, Idaho, is building new ksmith, machine and electrical shops, etc., at an ex- diture of $50,000.

The foundry owned by Harry Alldis, Chehalis, Wash., destroyed by fire recently, with a loss of about $4,000.

International Harvester Company, Spokane, Wash., has missioned architects to prepare plans for a machinery house to cost $75,000. Plans will be ready for bids in August.

Permit for the irrigation of 12,640 acres of land near nts Pass, Ore., has been issued to the Rogue River Pub- Service Corporation, Salem, Ore. The work will cost 5,000.

J. E. Pinkham Lumber Company, Seattle, has been in- orated for the sum of $150,000. Plans of the company e not been divulged.

Electric Utilities Company, Hillyard, Wash., has filed cles of incorporation with a capital stock of $50,000. incorporators are A. C. East, M. H. Gordon, George J. ge; and the attorneys are Gram & Hill, Spokane, Wash.

The International Log Bunk & Equipment Company, rtle, Wash., has been incorporated for $175,000, by mas M. Schmitz, L. A. Cook and others.

The Hood River Mfg. Company, Hood River, Ore., has n incorporated with a capital stock of $25,000 by F. J. tt, H. J. Frederick, C. A. Bell and others. It has pur- ased the entire stock of the Friday Mfg. Company and l equip a plant for the manufacture of electric cookers, ard cultivators and featherweight spray nozzles.

Texas

AUSTIN, TEX., July 31, 1915.

The period of hot, dry weather is having a depressing effect upon the machinery and tool trade. Many inquiries are being received, however, for pumping plants and other irrigation equipment.

The Royse Ice & Electric Company, Royse, has been organized with a capital stock of $16,000 to construct an electric light and ice plant. J. T. Murphy is a stockholder.

The Citizens' Gin Company, Emmett, will build a cotton gin to cost about $10,000. B. L. Moore is in charge.

The Texas Company, Houston, is laying a duplicate oil pipe line from Dallas to Port Arthur, a distance of about 300 miles.

The Interlocking Stave Silo Company, Victoria, plans to build a factory for manufacturing silos. Charles Easton is manager.

The Commissioners' Court of Dallas County, Dallas, has decided to purchase a 200-kw. engine and generator as additional equipment for the county power plant.

The Citizens' Water Works, Electric Light & Ice Company, Lockhart, has been organized with a capital stock of $100,000. It will build a waterworks and electric light plant and an ice factory. E. B. Coopwood is one of the principals.

The City Commission, Dallas, will receive bids until Aug. 23, for the remaining units of the municipal sewage disposal plant, including the pumping station and force main, to cost approximately $460,000.

The Mission Ice, Light & Power Company, Missouri, has been granted a franchise for electric light and waterworks plants. It will also build a 20-ton ice factory.

The lumber mill of the Aldridge Lumber Company, Aldridge, which was recently destroyed by fire with a loss of $250,000, will be rebuilt.

The International & Great Northern Railway has purchased a site near San Antonio upon which it will build new shops, roundhouse and yards at a cost of about $500,000. The company's general offices are at Houston.

Canada

TORONTO, ONT., Aug. 2, 1915.

Alexander Chaplin will take over the Defiance Iron Works, Windsor, Ont., to manufacture shells for the Dominion Government. He will purchase and install $20,000 worth of machinery.

The DeVilbiss Mfg. Company, Toledo, Ohio, will erect a factory at Walkerville, Ont., of brick and concrete construction, to cost $30,000. Construction work will be started about Sept. 1. It manufactures atomizers, etc.

The Bryan Mfg. Company, Collingwood, Ont., will rebuild its woodenware factory which was destroyed by fire. It will also establish another industry there and is asking the town for a loan of $20,000.

Adam Beck announced that the Hydroelectric Commission, Ottawa, Ont., will develop 100,000 hp. from the spillways of the Welland Canal.

The Dominion Aluminum Last Company, recently incorporated, has secured a site on McDougall Street, Windsor, Ont., for a factory to cost $10,000. The directors of the company are George A. Farabaugh, William H. Holland, George C. Clark, all of South Bend, Ind., and others.

Auger & Son, Ltd., Quebec, Que., has been incorporated with a capital stock of $100,000, to manufacture lumber, etc., by Amedee J. Auger, S. Drouin of Quebec, Que., and others.

The Boving Hydraulic & Engineering Company, Ltd., Lindsay, Ont., has been incorporated with a capital stock of $500,000 to smelt and refine minerals, ores, etc. William Flavelle, Donald McLean, John Carew, Lindsay, Ont., and others, are the directors.

The E. J. Woodison Company, Ltd., Toronto, Ont., has been incorporated with a capital stock of $100,000 by Charles H. Woodison, manager, 376 Dufferin Street, Toronto, Edward J. Woodison, Detroit, Mich., Charles H. Yahne, Sandwich, Ont., and others, to carry on a general machine shop and foundry business.

The D. J. Barker Foundry Company, Ltd., Brighton, Ont., will commence shortly on the construction of a new foundry plant. George Drewry is secretary.

The J. F. Ross Can Company, Ltd., Toronto, Ont., has been incorporated with a capital stock of $150,000 by John F. Ross, 560 King Street, West, Toronto, William E. Ross, manager, 57 Westmorland Avenue, and others, to manufacture cans, sheet-metal goods, boxes, jars, etc.

The W. J. Trick Company, Ltd., Oshawa, Ont., has been incorporated with a capital stock of $250,000 to manufacture lumber, etc. The provisional directors are John F. MacGregor, 6 Adelaide Street, East; Thomas S. H. Giles, 47 Afton Avenue, William B. Sturrup, and others, all of Toronto, Ont.

T. Z. Smith of Lombard, B. C., will build a factory for the manufacture of a patent gate.

It is announced that the Western Canada Flour Mills Company, Ltd., 74 King Street, East, Toronto, Ont., will build twelve elevators in southern Alberta this summer, each with a capacity of 35,000 bu.

The Seed Grain Grader Company, incorporated with a capital stock of $25,000, will build a plant at Regina, Sask., for the manufacture of seed grain grading machines. A. W. Edgar is president, and C. A. Torrance, managing director.

W. Humberstone's coal mine buildings at Edmonton, Alberta, were damaged by fire. The loss will amount to $1,070 to the boiler house and $3,500 to the machinery.

The Canadian Western Foundry & Supply Company, Third Street and Eighth Avenue, Calgary, Alberta, capitalized at $1,000,000, will build a plant at Calgary and commence at once on the manufacture of shells. W. H. McLaws is president; T. A. McAuley, vice-president; F. L. Bell, treasurer; A. T. MacWilliam, secretary, and George A. Mackenzie, manager.

The Winnipeg Paper Box Company, Ltd., Winnipeg, Man., has been incorporated with a capital stock of $50,000 to manufacture boxes, etc.

The Ditchburn Pleasure Boat Company's plant at Gravenhurst, Ont., was completely destroyed by fire. The loss will amount to several thousand dollars.

The sawmill of A. D. Clingen, Martintown, Ont., was destroyed by fire with a loss of $8,000.

The St. Thomas Construction Company, St. Thomas, Ont., is in the market for machinery for the manufacture of shrapnel shells. A. E. Ponsford, 605 Talbot Street, is a stockholder.

The planing mill of J. W. Hutchison, Commercial Street, Berewick, Ont., was destroyed by fire with a loss of $10,000.

Government Purchases

WASHINGTON, D. C., Aug. 2, 1915.

Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, until Aug. 24, schedule 8637, for one double-acting, one-geared press, for Washington: schedule 8634, for two non-reversible direct-current motors, for Newport; until Aug. 31, schedule 8646, for one 20 x 7 x 18 in. milling machine, for Philadelphia.

The United States Engineer office, Pittsburgh, Pa., will receive sealed proposals until Aug. 21 for furnishing and installing air compressors, a gas engine, turbine, an electric light plant, etc., at Lock No. 6, Monongahela River.

The acting supervising architect, Treasury Department, Washington, will receive sealed proposals until 3 p. m. Aug. 20, for two new boilers for the United States post-office and court-house, Fargo, N. D.

Customs Decisions

GEAR CUTTING PARTS NOT MACHINE TOOLS

The Board of United States General Appraisers has decided that gear cutters, gear testing machines and necessary tools for gear cutting machines cannot be entered as "machine tools" as that term is used in the tariff act of 1909. As the phraseology of the present tariff is identical with that of the older act, the board's ruling will apply to all importations of this kind brought in under the act of 1913. The case before the board was in the name of the W. H. Allison Company, Detroit. All of the goods were returned at 45 per cent under the old tariff as "manufactures of metal not specially provided for," where as the importers claimed a rate of 30 per cent as machine tools. The gear cutters in question were described as composed of high speed steel and were in the form of circular discs; they are about 4 or 5 in. in diameter, about ¾ in. thick, with a hole in the center a little over 1 in. in diameter, and around the periphery is a series of teeth, each tooth being ¾ in. long. When placed on the shaft of a gear cutting machine, these teeth cut into a bar or rod of iron and produce a worm gear. Another form of cutter involved in the protests was in the shape of a steel cylinder, solid, of irregular dimensions, having approximately midway between the two ends a series of teeth which p... from the cylinder about ½ or ¾ in. This cutter i... wise composed of high speed steel and is techn... known as a "hob," which operates on the worm ... in much the same way as the single gear cutters ... described, except that it cuts more than one too... a time.

Judge Fischer, in his decision signed by the ... members of the customs tribunal, says that a ... driven machine operating these hobs and cutters ... unquestionably be properly classifiable as a ma... tool; but, when invoiced and shipped separately ... they are in this instance, the hobs and cutters in ... tion constitute merely parts of machine tools, for ... parts there is no specific tariff provision. The co... sion is reached that they are necessarily relegat... the provision covering manufactures of metal not ... cially provided for in paragraph 199, the decision ... collector being affirmed.

The testing machines under consideration con... of power driven mechanisms especially designed fo... sole purpose of testing the accuracy of the cutting ... performed by the gear cutting machines. The ... classes of machines are entirely separate and dis... and work independently of each other. The te... operation involves no cutting whatever and makes ... lutely no change in the physical status of the pr... of the gear cutting machine. Judge Fischer point... that the uniform practice of the board is that only ... machines as are driven by other than hand power... that work upon metal, employing in their opera... cutting tools, are machine tools.

STEEL BALLS FOR CRUSHING

Hawley & Letzerich, Galveston, went before ... board with the claim that steel balls imported unde... present tariff should be admitted to entry at 12 per... as steel forgings. The merchandise was returne... the collector at 35 per cent as ball bearings. The ... for the lower duty was amply supported by the u... tradicted testimony offered on behalf of the impo... which showed the merchandise to consist of steel ... which have not been further advanced than the fo... process and which are used for crushing cement ... ores. The claim was sustained.

ALUMINUM IN SHEETS

The board decided that slight changes made i... aluminum provision of the present tariff do not ... rant the disturbing of classifications made under ... tariff act of 1909. The case was that of the Amer... Metal Company, Ltd., New York, which imported a... num rectangular in shape and of sizes varying fro... to 18 in. to 20 x 40 in., and from 0.035 to 0.04 ... thickness. Duty was taken at 20 per cent under ... present law as manufactures of metal, while it ... claimed to be properly dutiable at 3½c. per lb. ... paragraph 143 as aluminum in sheets. Considera... testimony was offered to show that aluminum in ... form and sizes involved is and for a number of ... has been uniformly and generally recognized in ... trade and commerce of this country as sheet alumi... Paragraph 143 does not provide for sheet alumi... but it does make provision for aluminum in sh... which the decision holds are purely descriptive w... In overruling the protest the decision cites decisio... the United States Court of Customs Appeals, which ... deemed applicable to the present case.

Plans for the establishment of a blast furna... St. Louis are being considered by St. Louis capita... as the result of the manufacture of by-product co... that city. It is stated that about $1,000,000 has al... been tentatively subscribed and the proposal ... establish a company with about $3,000,000 ca... Among those interested are Edward F. Goltra an... D. Dana. It is planned, among other things, to ... some if not all the ore from deposits in central ... controlled by the capitalists interested and to u... the old Missouri furnace site at the southern en... St. Louis by modernizing the plant which was ... doned about three years ago.